NATUR CYMRU
Nature of Wales

Number/Rhif 60 • Autumn/Hydref 2016

- The Brexit landscape and CAP
- Hoverflies
- Gwastadeddau Gwent
- Rust fungi
- Grizzled skipper
- Marine food chains
- Canals

Books, news, comment ...

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Sieciau'n daladwy i Natur Cymru Cyf., neu ewch i www.naturcymru.org.uk

Natur Cymru is published four times per year, in March, June, September and December. Articles are published in the language in which they are submitted. All prices include UK P&P.

• Individual £18.00 • Direct Debit £17.00 – please enquire • Corporate £32.00 • Back issues £3.50
Special offer to subscribers only – 5 or more back issues for only £1.00 each

BINDERS hold 10 issues, complete with index:
1: £8.95 • 2: £16.95 • 3: £24.95 • 4: £31.95 • 5: £39.50.
Cheques payable to Natur Cymru Ltd., or visit www.naturcymru.org.uk

Cwmni Cyfyngedig trwy Warant yw Natur Cymru Cyfyngedig, ac nid yw'n gwmni sy'n gwneud elw. Mae wedi ei gofrestru yng Nghymru a Lloegr, rhif 5636217. Nid barn Natur Cymru Cyfyngedig neu'r Golygyddion a leisir yn y cylchgrawn hwn o angenrheidrwydd.

Natur Cymru Limited is a non-profit making Company Limited by Guarantee, registered in England and Wales, no. 5636217. The views expressed in this magazine are not necessarily those of Natur Cymru Limited or of the Editors.

Llun y clawr/Front cover:
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Argraffwyd yn y DU gan Cambrian Printers Ltd. Achrediad ISO-14001 a Systemau Rheoli Amgylcheddol blaenllaw. Argraffwyd ar bapur Credid Cymysg o ffynonellau cyfrifol yr FSC Mwydion o goedwig a ardystir gan yr FSC. Ffynonellau a reolir, heb gynnwys coedwigoedd annerbyniol. Rhif cadwyn gwarchodaeth TT-COC-002200. www.fsc-uk.org

Printed in the UK by Cambrian Printers Ltd. ISO-14001 accredited with award-winning Environmental Management Systems. Printed on FSC Mix Credit paper. Pulp from an FSC-certified forest. Controlled sources, which exclude unacceptable forestry. Chain of custody number TT-COC-002200. www.fsc-uk.org

ISSN 1742-3740

Lluniau eraill/Other illustrations: Peter Hope Jones, Mandy Marsh

Dylunio gan/Design by: Mel Parry Design, dmelparry@gmail.com

NATUR CYMRU CYNNWYS • CONTENTS

Golygyddol / Editorial • James Robertson ..... 2 - 3

The impact of Brexit on Wales and its natural environment • Roger Thomas ..... 4 - 6
How the proposals for an English Brexit may not apply in Wales

After CAP: butterflies in the hills • James Robertson ..... 7 - 11
A new way of farming in a post-Brexit Wales

Why bother with a hover? • Andrew Lucas ..... 12 - 15
A close look at hoverflies, the unsung heroes of pollination

Seabirds as sentinels • Ivor Rees ..... 16 - 19
Seabird population fluctuations reflect the condition of marine ecosystem and food chains

The grizzled skipper's fortunes in Wales • Judy Burroughs & George Tordoff ..... 20 - 24
Studying the egg-laying habits of this butterfly may help to reverse its decline

Bywyd gwyllt ynghudd mewn man amlwg: cyfrinachau Gwastadeddau Gwent • Richard Bakere ..... 25 - 29
Ardal unigryw o fawnog a chyrsiau dŵr

Welsh canals revisited • Jonathan Briggs ..... 30 - 35
The Canal and River Trust are now responsible for the ecology of canals in Wales

Welsh rust fungi - the case for conservation • Ray Woods ..... 36 - 41
Why understanding parasitic fungi is so important

Saving the Gwent Levels • Gwent Wildlife Trust 42

NODWEDDION ARFEROL / REGULAR FEATURES

Buglife • Mandy Marsh 43
Urban Buzz success - the shrill carder bee in Cardiff

Lifelines • Stuart Smith ..... 44 - 45
Natural Resources Wales - grounds for celebration

Green bookshelf • James Robertson, David Saunders, David Parker, Geoff Gibbs ..... 46 - 47

Discoveries in science • Tom F. Cotterell ..... 48 - 49
Recent highlights of Welsh mineralogy

Dispatches from the hills • David Elias 50
Sitting on the fence

From the Garden • Bruce Langridge 51
Butterflies attract the crowds

Nature at large • Geoff Gibbs 52
The ups and downs of Welsh cuckoos

GOLYGYDDOL

Mor gyflym y gall newid ddigwydd o fewn ein tirwedd wleidyddol. Mae'r dirwedd ffisegol, ar y llaw arall, yn ymddangos yn llawer mwy sefydlog ac yn cynnig cyd-destun a llinyn o barhad i'r cyfan sy'n digwydd o'n cwmpas. Mae natur, fel ag erioed, yn nodi tro'r tymhorau a rhod ein bywydau. Mae'r heidiau gwenoliaid yn paratoi unwaith eto i ffarwelio â ni, y gingroen yn gwthio'i ben drwy'r pridd i lenwi'r aer ag oglau pridd a phydredd; rydym yn gweld bedd yr haf o'n cwmpas ym mhob man, ac aeddfedrwydd lleddf hydref yn llithro dros y tir.

O dan yr holl fynd a dod sy'n digwydd ar draws y cynfas mawr mae 'na fyd prysur, llawn manylder – byd sy'n cael ei ddisgrifio yma mewn erthyglau ynglŷn â phryfed hofran, môr-wenoliaid y Gogledd, gwibwyr brith, ffyngau'r gawod goch, camlesi a Gwastadeddau Gwent. Mae pryfed hofran yn beillwyr mwy pwysig na gwenyn mêl. Maen nhw'n helpu ffermwyr i gynhyrchu cnydau mwy toreithiog, ond faint ydyn ni'n ei wybod am anghenion y creaduriaid bach hyn? Mae ymweld â llecynnau llawn blodau gwyllt ar ddiwrnodau llonydd a chynnes yn ystod yr haf yn ddigon o gymhelliad i fynd allan i ddarganfod mwy.

Mae camlesi'n gwau drwy'r dirwedd ac yn cynnig cynefinoedd i larfâu pryfed hofran, os cânt eu rheoli'n ofalus yn ystod y cyfnod pwysig hwnnw wrth i lystyfiant sefydlu ar hyd yr ymylon a chyn i'r cyfan droi'n dagfa wyllt. Mae'n bwysig ein bod ni'n cymryd rhan yng ngwaith Glandŵr Cymru fel na fydd anghenion bywyd gwyllt yn cael eu hanghofio. Mae Gwastadeddau Gwent yn wynebu math arall o fygythiad, sef traffordd. Mae'n ardal hynafol lle mae byd natur a hanes yn plethu i greu tirwedd hollol unigryw sy'n haeddu cael ei gwerthfawrogi. Mae cynllun ar y gweill i helpu cynnal bywyd gwyllt, cymunedau a thirwedd hanesyddol yn y llecyn anhygoel hwn. Anghenion syml sydd gan löynnod y gwibiwr brith ar dwyni tywod neu ar hen safleoedd diwydiannol ac mae'n hawdd adlewyrchu hyn wrth wneud penderfyniadau ynglŷn â rheolaeth. Mae hi o fewn ein gallu i ystyried gofynion pob un o'r rhywogaethau hyn. Un ffynhonnell o gymorth yw'r ddeddfwriaeth sydd wedi datblygu dros ddegawdau i warchod ein bywyd gwyllt. Roger Thomas sy'n ystyried beth allai ddigwydd i'r ddeddfwriaeth hon yn sgîl y penderfyniad i adael yr Undeb Ewropeaidd.

Dros gyfnod gall newidiadau bychain mewn dulliau rheolaeth tir drawsnewid yr amgylchedd, gan ei gyfoethogi neu ei wneud yn fwy llwm. Yn y rhifyn hwn rwy'n dadlau bod yr amser wedi dod i synnwyr cyffredin tawel drechu wrth lunio polisi amaethyddol newyd. Rhaid i ni godi llais os ydyn ni am weld ein trethi yn cael eu defnyddio i sicrhau bod newidiadau yn ein tirlun amaethyddol yn rhai buddiol; rhaid i ni wneud yn siŵr na fyddan nhw'n difrodi natur na chwaith yn andwyo cenedlaethau'r presennol a'r dyfodol.

James Robertson

©Mel Parry

Ynysoedd Y Moelrhoniaid
The Skerries

EDITORIAL

It is extraordinary how quickly the political landscape can change. The physical landscape appears much more stable, providing continuity and context. Nature marks the seasons and the ages of our lives. A farewell of swallows lines up on the wires. Stinkhorns let off their farts, heading autumn's parade of colours and earthy perfumes; decomposition's hour approaches. Nature's clock ticks, green slipping into gold.

Beneath appearance is a world of detail, described in articles on hoverflies, Arctic terns, grizzled skippers, rusts, canals and the Gwent Levels. Hoverflies are more important beneficial pollinators than honeybees. They meet farmers' needs by increasing crop yields, yet how much do we know about their needs? Flower-rich places on warm, still summer days offer an incentive to find out.

Canals thread through the landscape, offering habitat for hoverfly larvae, if managed sensitively at that critical stage between corridor of water and undermanaged jungle. We should get involved with the Canal and River Trust so that the interests of nature are not forgotten.

The Gwent Levels face another kind of transport threat, a motorway. It is an area of antiquity, a union of history and natural history which defies definition and deserves appreciation. A project is now underway to support the wildlife, people and historic landscape of this extraordinary place. Grizzled skippers on sand dunes or former industrial sites have simple needs, knowledge of which can be translated into the right management. It is within our capabilities to cater for the detail of all of these species. One source of help comes in the form of our safety net of wildlife protection. Roger Thomas explores what leaving the EU could mean for this legislation.

Small changes to land management over time have the power to transform the environment, enriching or impoverishing it. In this edition I argue that the moment has come for quiet common sense to triumph over loud vested interests in the making of a new farm policy. We need to speak up if the changes to the farmed landscape which are shaped by our taxes are to be beneficial ones; they must not damage nature and the interests of present and future generations.

James Robertson

Mike Alexander

The impact of Brexit

on Wales and its natural environment

Freshwater West in Pembrokeshire, one of the best beaches in Wales, regularly hosts surfing tournaments

On 23 June 2016, the United Kingdom voted in a referendum to leave the European Union after over 40 years of membership. ***ROGER THOMAS*** *considers what this irreversible decision may mean for the natural environment of Wales.*

Only 30 years ago, the UK was dubbed the "dirty man of Europe", a consequence of our unwelcome exports of power station emissions and our habit of dumping untreated sewage into the seas. In the intervening years, membership of the European Union (EU) has transformed the quality of our natural environment through our adoption and compliance with Europe-wide laws that recognise that nature does not conform to political boundaries and must therefore be managed on this wider scale. Of course it's not enough: wildlife is still in decline and the extinction of species has not yet been halted, but without this legislation the natural world would arguably be in a much more parlous state.

So what does the 23 June 2016 decision to leave the EU, Brexit, mean for the natural environment of Wales? As in all change – and change doesn't come much bigger than this – there is both risk and opportunity: risk that we could reverse the progress of recent years and opportunity to learn from what we've done and do things better.

When Article 50 of the Lisbon Treaty, the latest manifestation of the Treaty of the European Union under which the Union was formed, is invoked by the UK Government, there will be a two-year process of negotiated withdrawal. At the end of this period, whether or not negotiations have been satisfactorily concluded, the UK will leave the EU and the Westminster government will revoke the European Communities Act, thus ending our requirement to follow EU law.

But what happens then? The environment is an area fully devolved to Wales and by convention (the Sewel convention) Westminster cannot legislate for any change in a devolved government's powers without that government's consent. Indeed, this convention is set to become a legal requirement in the next Government of Wales Act, as it already is in Scotland.

So if Westminster is unable to take back control of the environment – something to which the Welsh Government would not readily accede – and EU law no longer applies, then how will Wales respond? Environmental law is probably the most comprehensive area of EU reach, through a series of regulations (rules that apply absolutely across the Union) and directives (outcomes that must be achieved, the route for which can at least partly be determined nationally). They have served us well in Wales, as testified by our attractive beaches, quality shellfish, cleaner freshwaters, improved air quality, and protected habitats and species. Helpfully, the First Minister told a 4 July 2016 meeting of environment and rural affairs bodies that the Welsh Government would not want to see any weakening in EU legislation and, by implication, of the achievements of this legislation.

This should stand us in good stead as the discussions on future trade agreements get underway. The UK Government's aim will be to have deals in place that can be enacted as soon as the two-year withdrawal period ends. There is much debate as to whether or not this is an achievable goal, highlighting yet again the incredible fact that there was no plan in place for Brexit, on which every issue now being raised becomes a moot point!

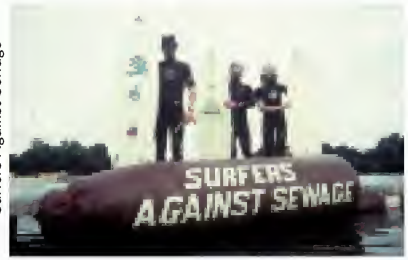
©Jiri Rezac/Greenpeace

In 2016 Greenpeace highlighted the problems of pollution by fixing masks to many prominent statues around London, including Nelson's Column.

Of the potential trade deals, these range from remaining within the European Economic Area (EEA), adopting models similar to Norway or Canada, through to simply negotiating directly with individual countries. The EEA gives access to 500m people (note that the population of the USA is 300m) and everything is already in place, so would we want to lose this access to markets we know? The downside is that the UK would have to contribute financially and comply with much of EU law, but would have no voice in developing future EU policy and legislation. Crucially, from an environmental perspective, compliance with some key EU Directives is not currently a requirement under the EEA; these include directives on habitats and species, shellfish waters, bathing waters, and freshwaters needing protection or improvement in order to support fish life. Whilst we have domestic protected sites legislation (Sites of Special Scientific Interest or SSSIs) as a reasonably good backstop for terrestrial and coastal zone habitats, we have only one small Marine Conservation Zone in Wales for the marine environment. The conclusion must be that any potential trade deal will present new challenges, but also opportunities, for managing the natural environment.

With or without European law, we will lose the associated monitoring and enforcement; there simply

won't be a judicial process that ensures compliance or delivers sanctions. However, widen our view further and it becomes immediately apparent that the bedrock of international environmental commitments (including the Bern, Bonn and Ramsar Conventions; Convention on Biological Diversity; Control on International Trade in Endangered Species; Convention for the Protection of the Marine Environment of the North-East Atlantic), underpinning what the European Union has developed, will remain firmly in place.



Surfers Against Sewage

Surfers Against Sewage began their campaign for better water quality in 1990 and were helped by the EU Bathing Water Directive and the Urban Waste Water Treatment Directive

If international commitments provide confidence that our achievements to date can be safeguarded, what will drive the wider progress that a better future so clearly demands? Access to European funding, from which Wales has been a significant beneficiary, will end, although the UK Government has just announced that it will underwrite already confirmed EU funding up to 2020. Beyond that we will at best have only the match funding within our control, the typically 30 to 50% contribution that stands alongside EU money to make up the total spend. The severing of our links with the Common Agricultural Policy, the Common Fisheries Policies and the LIFE programme, emphasises the need for all concerned with the natural environment – food, farming, fishing, tourism and environmental sectors – to work together on new management models that deliver benefits for the general public and therefore merit its support.

***Roger Thomas** is a former Director of Environment Agency Wales and Chief Executive of the Countryside Council for Wales. He is currently Chair of the North Wales Wildlife Trust, Coed Cymru and Wales Environment Link.*

Shore dock *Rumex rupestris* grows in only a few locations in Wales and is protected under the EU Habitats Directive

Beth yw effaith Brexit ar Gymru?

Nid yw byd natur yn cydnabod ffiniau gwleidyddol ac mae deddfau'r Undeb Ewropeaidd (UE) wedi ceisio gwarchod yr amgylchedd ar draws ffiniau. Mae bod yn aelod o'r UE wedi bod o fantais fawr i Gymru; mae wedi arwain at greu moroedd glanach, at warchod cynefinoedd ac at wella ansawdd awyr. Drwy bleidleisio i adael y UE byddwn yn torri cysylltiad gyda pholisïau fel y Polisi Amaeth Cyffredin, ynghyd â'r holl gyllideb sydd ynghlwm â nhw. Mae rheolaeth yr amgylchedd wedi ei ddatganoli'n llwyr i Gymru ac ni all San Steffan greu deddfau i newid unrhyw beth heb gydsyniad Llywodraeth Cymru. Felly os na all San Steffan gymryd rheolaeth, ac os nad yw deddfau'r UE yn gymwys bellach beth fydd Cymru'n ei wneud? Ni fydd unrhyw reidrwydd ar Gymru i gydymffurfio gyda gofynion yr UE na'u gorfodi. Ond bydd nifer o gytundebau rhyngwladol ehangach yn dal i fod mewn grym, fel y Gytundeb ar Amrywiaeth Fywydegol.

After CAP: butterflies in the hills

Andreas Eichler CC-SA 4.0 International

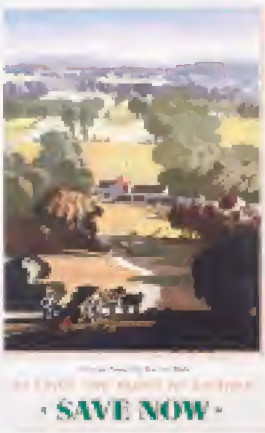
Small heath butterfly (*Coenonympha pamphilus*, gweirlöyn bach y waun), one species that is at home in the uplands

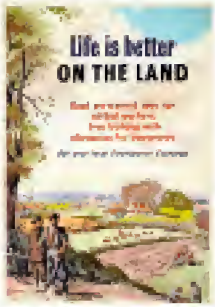
Leaving the European Union will mean the end of the Common Agriculture Policy (CAP) in Wales and the UK. Writer and farmer JAMES ROBERTSON argues that this could bring new opportunities for a closer working relationship between Welsh farmers and wider society.

"The subsidy system is broken. Taxpayers should only pay public subsidy to farmers in return for things which the market won't pay for but which are valued and needed by the public." This analysis by the National Trust's Director General, Dame Helen Ghosh[1], faces two challenges: farmers and their representatives will fight such a move tooth and nail; and the public has a poor understanding of the intricacies of land management. For most people, farming is good; few differentiate between different forms of farming.

A farmer who helps manage a National Nature Reserve told me recently that he could not survive without the subsidy cheque he gets – it provides half his income. In his mind, that subsidy is given to him for producing food. The flood preventing, carbon storing, wall re-building and habitat managing work he does are by-products. How much better it would be if he received his subsidy for these services to the public, I thought, and his farming stood on its own two feet.

Against my boundary is a large estate farm where the hedges have





After food shortages in two World Wars the Government used posters to encourage people to work on the land and value farming.

been cut back, ditches opened, wetlands sprayed out and infrastructure built to convert the land into a New Zealand-style dairy unit. It is industrial farming, aiming to produce milk profitably at the lowest possible unit cost, by replacing labour with capital. It has its place: dairying and farming in general need to be able to develop without excessive bureaucratic hurdles, but not with the help of subsidies from taxpayers.

In the wake of the Common Agricultural Policy (CAP), farm businesses face stark choices: intensify, diversify or hunker down. The first means competing with the commodity markets, producing more grain, beef, lamb or milk at lower cost by borrowing from the bank, investing in technology, buying more land and machinery, and growing the business. The second means developing new enterprises and other land-based sources of income, such as tourism. The third way depends on what replaces the CAP, but it could be the answer for many small farms and those in areas of high environmental value: cut costs and receive payments in return for delivering public benefits. Before turning to this option, I need to remind myself what farmers think about all this.

Family farms are at the heart of rural Wales, and they need to work financially. Farming provides many benefits for Society, and farmers have many land management skills which Society needs. But farmers are focused on a single purpose – food production. They want to farm. They depend on subsidy, and most believe that the subsidy should be there to keep them farming. In the uplands this is felt with a passion.

Butterflies

In a *Guardian* debate before the European Union (EU) referendum, Andrea Leadsom, now the new UK Environment Secretary, suggested that it would make more sense "if those with the big fields do the sheep, and those with the hill farms do the butterflies". This was greeted with fury in the Welsh hills. A well-known upland farmer, speaking on Radio 4's *Farming Today* before the Royal Welsh Show, responded: "That is an absolute insult to us". Without farmers and their stock, he argued, the uplands would go to rack and ruin.

Farmers believe that the public should subsidise a commodity, lamb, which depends on an export trade, and keeps farming in the hills. However, many will agree with Leadsom's succinct, graphic way of saying that subsidies should be concentrated on farmland which is hard to farm profitably but which could provide wider benefits to society.

Letting hill farms 'do the butterflies' would deliver great benefits for Society in terms of flourishing wildlife, reduced flooding and store carbon. This focus for funding would also draw the public (who provide the funds) and the farmers (who provide these benefits) closer together. The possibilities are almost beyond imagining; a matrix of natural woods and moorland in the uplands; meadows, flood plains and a properly managed coastal fringe in the lowlands; a natural environment to rival anything in Europe. Visitors would stimulate the rural economy, bringing new employment opportunities to rural communities, from timber-based crafts to niche food

products. None of this need compromise food production, or 'food security'.

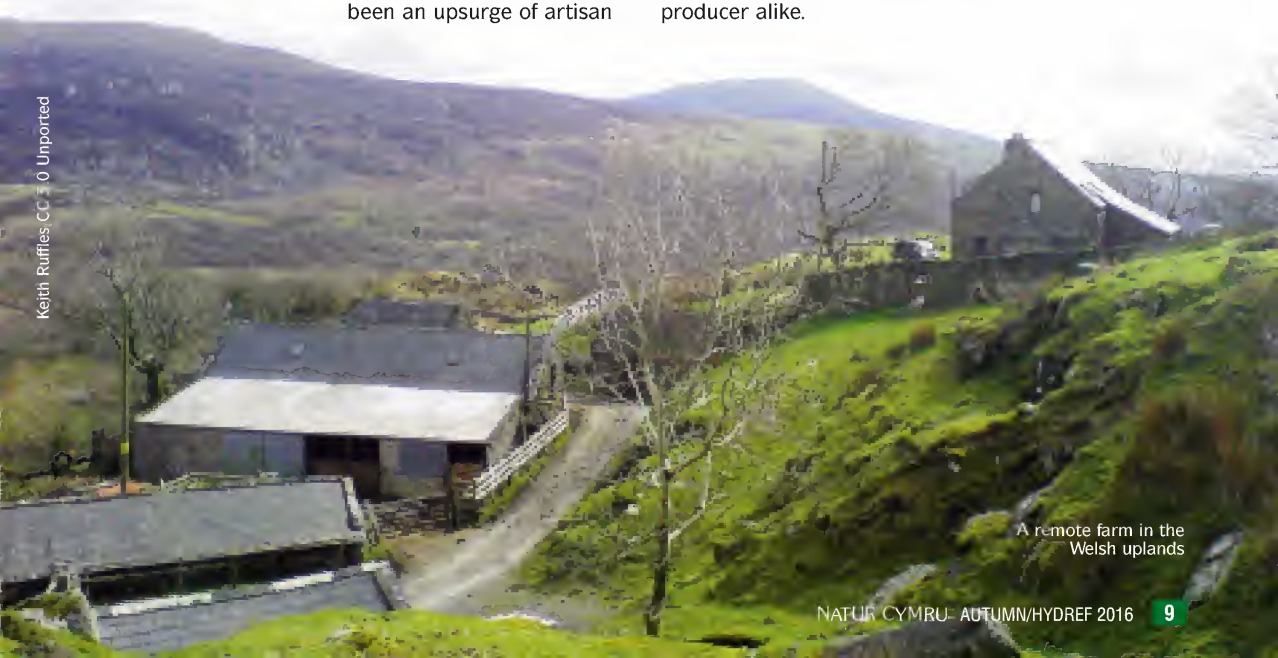
Success would depend on devising a universal, simple, easy-to-administer farm support scheme for all farmers who want to deliver public benefits, related to the scale of the benefits which farms could deliver, which would be greatest in areas of high environmental value or potential. Payments could be tiered, with the highest level for Sites of Special Scientific Interest (SSSI), turning them from a handicap to a farm asset, and paying a bonus of perhaps 5% and 10% for achieving modest or major improvements to the site condition after five years. They could be based on outcomes rather than bureaucratic prescriptions, and be at a landscape scale. Only one rule is required to make this possible. Public subsidy should go to farmers who are delivering public benefits. The commodity farmers must rely on the markets.

The exponents of the livestock and dairy industries will oppose this, and argue that subsidies should be a social payment, necessary to ensure food security. They have a powerful voice in Welsh farming, but it is neither logical nor prophetic. Diets are changing, with less emphasis on meat, and people are becoming more interested in and questioning about their food, in response to which there has been an upsurge of artisan foods. The enterprising individuals who are putting Wales on the foodie map often come from outside the ranks of the farmers whose narrow interests are fought for by the farming unions.

Rural development

The Welsh Government has long recognised this dichotomy, and has tried to develop policies to encourage farming enterprise through the rural development programme. Cross-cutting initiatives are what Wales is good at, such as the intersecting goals in the Well-being of Future Generations (Wales) Act; or the weaving together of food production and consumption into school meals and play grounds, improving the life chances of Welsh children. The thinking is joined up, although this does not always translate into action. *Sustainable Farming and Environment: Action towards 2020*[2] is a recent example.

Yet these initiatives have been framed against a background of agricultural subsidy which is administratively burdensome and entrenches commodity farming. Whatever the many benefits of EU membership, the environmentally destructive juggernaut of the CAP is not one of them. There is a chance now to make agricultural policy simpler, more transparent, and much more fine-tuned and nimble. Above all, it needs to be fair to consumer and producer alike.



Keith Ruffles CC BY 2.0 Unported

A remote farm in the Welsh uplands

Joanna Robertson

In recent years there has been an increase in farmers' markets offering locally grown food

Society and farming need to understand each other better and grow closer together. There are many aspects to the bargain between the two parties, those who pay and those who receive payments, which could be mutually educative. When we buy food, we need to think beyond the price on the label. As the CAP comes to an end, there is a great opportunity to spread the message that the food we put on our tables influences the landscape around us, for good or ill. The public have little understanding of land management and its importance for public health and wellbeing. Policy reform, and what happens to the limited financial support which will be available for farmers and land managers, provides a great opportunity to break down barriers and back up the message that we all have a role to play.

When my wife and I got together with a group of vegetable growers more than a decade ago to sell our produce collectively, we found that whatever we grew flew off the stall at our farmers' market. People would be waiting at stall opening time, and sometimes bought our entire output of the most favoured crops, chard, asparagus and lady's fingers. The problem wasn't finding buyers, it was finding more willing producers, and making the hard work involved pay. As organic producers we received help from the Welsh Government's Organic Farm Scheme, as well as support from the Soil Association and Organic Centre Wales. Subsidy, though, was minimal compared to what conventional livestock farmers were getting; the CAP was not encouraging enterprises like ours which brought producer and consumer together. We didn't complain, but observed how much easier it would have been to stick to beef and sheep and the subsidy cheque.

Speaking up

Farmers are a varied bunch of people, and many do not fit the mould which I have so far described. Income may be less important than being on the land. Some would cling onto their 'uneconomic' farms until their last gasp. They would be happy to manage the land for benefits to nature, flood prevention, carbon sequestration and so on, if payments allowed them to stay on the land. In my experience these farmers don't shout loudly. They sit quietly in farmers' meetings or avoid them altogether. They are a disparate group whose experience or inclination has made them wary of farm politics. They have no voice. They are unrepresented. Even if I write the odd article, I still rank in their number.

For almost 25 years I have looked after a small pasture farm of about 70 acres. The underlying reason why farming has been my lifelong goal was and is the exposure to nature which farming brings. A quarter of a century of organic farming has produced a huge wildlife dividend, in contrast to what I have seen happening on land around me.

It is right that upland farmers like the one on Radio 4, who have much at stake, should be heard. Yet it is a concern that those who shout loudest always get the most. One farming voice holds a megaphone, while many voices whisper. So the National Trust's voice is important, united as it is with voices across the spectrum of environmental bodies with their feet firmly in Welsh soil. There are also bodies in the agricultural sector such as the Country Land and Business Association (CLA) and Tenant Farmers Association (TFA), which recognise the sense behind the calls for a new deal. It is up to all of us, including the many people who have complained bitterly about the injustices of the CAP, to make our voices heard and find a way to draw farming and public interests together in a way which works for Wales.

Joanna Robertson

Life on the Robertsons' farm: varied habitats mean wildlfowers are able to flourish, there's a healthy vegetable crop and organic cows are happy cows!

A new start for agricultural policy should be an opportunity to bring farming and society closer together. It needs to be fair to farmers of all types, and it needs to be fair to the people who pay the bill, and to the environment which supports us all. Farmers need a lasting, secure contract with the public. As land managers, only they can give meaning to the overused phrase 'sustainable farming'.

A speaker on Radio 4's *Farming This Week* recently summed it up: "Sustainable agriculture makes us all farmers. We spread cow dung and birdsong every time we shop, and every mouthful we eat shapes the world". Decisions about what will replace CAP have huge implications for sustainable agriculture, for the environment, and for the gap between producer and consumer. Get it right and everyone benefits. We are all one community.

Acknowledgments
My thanks to David Harries, Joanna Robertson, Rachel Sharp and Arfon Williams for their comments.

James Robertson *was founder/editor of* Natur Cymru, *and is an environmental writer and land manager.*

References
1. *The Guardian* website, 4 Aug 2016.
2. Welsh Government, 2007. *Sustainable Farming and Environment: Action Towards 2020*. Report by an independent group to the Welsh Assembly Government.

Glöynnod byw yn y bryniau: Wedi'r PAC

Wrth adael yr UE byddwn yn ffarwelio gyda'r Polisi Amaeth Cyffredin (PAC) a'r taliadau sybsidi o'r UE. Bydd penderfyniadau ynglŷn â'r hyn a ddaw i gymryd lle'r PAC yn dylanwadu'n fawr ar amaethu cynaliadwy, ar yr amgylchedd, ac ar y bwlch rhwng cynhyrchwyr a defnyddwyr. Mae nifer o ffermwyr yn credu mai pwrpas taliadau sybsidi yw eu helpu i gynhyrchu bwyd a rhoi sicrwydd i'r genedl ynglŷn â chyflenwad bwyd at y dyfodol. Does gan y cyhoedd fawr o ddealltwriaeth ynglŷn â rheolaeth tir a phwysigrwydd hyn ar gyfer iechyd a lles pobl. Pe bai cynhyrchu bwyd o dan reolaeth lwyr y farchnad, a thaliadau wedyn yn cael eu rhoi i gynnal y gwasanaethau hynny sydd eu hangen ar gymdeithas, fel rheoli llifogydd, fe allai hyn greu cysylltiadau cryfach rhwng ffermwyr a'r cyhoedd. Mae nifer o amaethwyr yn dewis aros ar y tir am eu bod nhw'n caru ffermio a byddent yn falch o'r cyfle i allu gweud hynny.

Linda Nottage

Why bother with a Hover?

Formerly *Arctophila superbiens*, the name of this species has now changed to *Sericomyia superbiens*

Most of us are aware that hoverflies are beneficial insects but don't take our interest much further. Yet there are many facets to hoverflies, as ANDREW LUCAS explains. His studies have taken him into the field of DNA 'barcoding', but a love of nice places in sunny weather, careful observation and a book are all you need to get started.

Linda Nottage

Chrysotoxum festivum

Why study hoverflies? Imagine insects that help pollinate our food, eat agricultural pests, and show fascinating physical and behavioural adaptations. Imagine a group, some of which can be easily identified, whilst others can be difficult, even under a microscope. Hoverflies are all these, and more. So the question isn't 'why study hoverflies', but 'why does anyone study anything else?'.

There are 283 species of hoverfly in Britain, slightly outnumbering bees, with new species being added to the British list at the rate of about one a year. They range from tiny species a few millimetres long to large bumblebee mimics. Some species can be identified with the naked eye, but many, especially in the genus *Cheilosia*, are black, rather nondescript insects which present a serious identification challenge.

The defining feature of hoverflies can be found in the wings. Cross veins run parallel to the trailing edge of the wing, forming a 'false margin'. There is also a 'spurious vein', a hinge in the middle of the wing unique to hoverflies. This allows the flapping wing to 'pop' like the lid of a jam

jar, contributing to a hoverfly's extraordinary aerial manoeuvrability.

Hoverfly biology

Hoverflies are Diptera and, like all two-winged flies, they have a lifecycle of egg, larva, pupa and adult. The larval stage is arguably the most ecologically interesting. They may be carnivorous, herbivorous or saprophagous, feeding on decaying plant matter, and occupy a wide range of habitats. About 40% of hoverflies have carnivorous larvae, such as the familiar marmalade hoverfly *Episyrphus balteatus*, whose larvae prey on a number of aphid crop pests.

As adults, hoverflies feed on pollen and nectar, with a small number of species utilising honeydew collected from leaves. When landing on a flower, a hoverfly will systematically investigate the flower head for food. Once food is detected, the proboscis is extended until the tip comes into contact with the nectar. Whilst feeding, hoverflies can become covered in pollen; as one colleague put it, "they're like babies with chocolate". As a result, they can spend up to 20% of their time cleaning pollen from their bodies, and often eating it, as it is a valuable source of fat and protein. Once eaten, the contents of pollen grains are extruded under osmotic pressure in the gut, rather like a beansprout, releasing their contents. Pollen grains, minus their contents, are often visible, and identifiable, in hoverfly faeces.

Mimicry

Hoverflies are well known for their spectacular mimicry of bees and wasps, and about half of all species show this adaptation. The principle is simple; by looking like something fierce and dangerous, predators will leave you alone. *Volucella bombylans* is an impressive mimic of bumblebees, and *Chrysotoxum* species can be easily mistaken for wasps. *Eristalis tenax* is a mimic of the honey bee whose mimicry extends to behavioural adaptations such as 'pulsing' the abdomen in the manner of a bee, and flying with its rear legs trailing, giving the appearance of the bee's pollen baskets.

But whilst some hoverfly mimicry is almost perfect, many, such as *Platycheirus* species, are decidedly

Kevin Bandage

Cheilosia pagana with pollen load

unimpressive mimics, with just a few yellow spots on the abdomen. What is the point of looking 10% like a wasp? A number of reasons had been suggested, but research has shown that the most imperfect mimics tend to be small species. Because they provide a poor reward for predators, the selection pressure for them to mimic Hymenoptera is lower, reducing the evolutionary drive to ever more perfect mimicry.

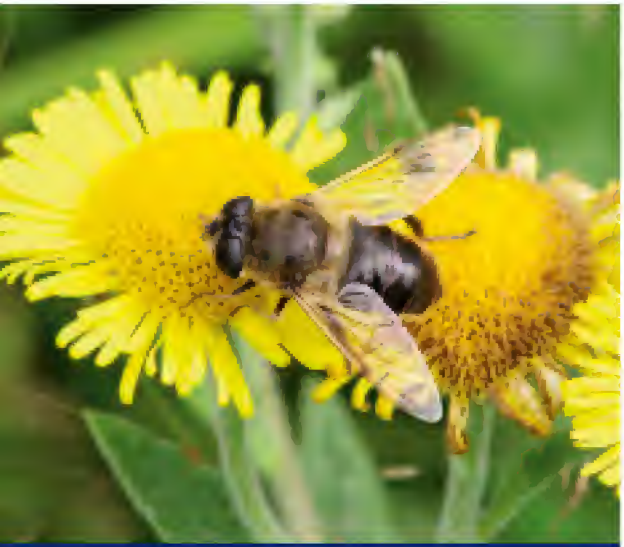
Hoverflies in agriculture

Honey bees are often assumed to be the major pollinators of our crops, but there is now abundant evidence that wild pollinators are more important, with domestic honeybees playing a supporting role.

Hoverflies have been demonstrated to be effective crop pollinators. In Ireland, an experiment excluded wild pollinators from oilseed rape, which reduced productivity by 30%. This indicated that the pollination service provided by wild pollinators, including hoverflies, was worth about €3.9 million per annum to Irish farming in enhanced crop production. Hoverflies are also pollinators of a range of other crops, including apples and raspberries. A study in England has shown that setting aside land as wild pollinator habitat increased crop yield on the remaining land, suggesting that supporting wild pollinators can actually increase farm productivity.

Hoverflies in Wales

Located on the wet and windy west coast of Britain,



Linda Nottage

Eristalis tenax

Wales may not appear to be the best place to study hoverflies. However, we do have a number of species that, whilst not confined to Wales, do have a significant part of their distribution here.

Rhos pastures may be better known for marsh fritillaries, but the flowers of devil's bit scabious in late summer provide food for the large bumblebee mimic *Sericomyia superbiens*, a western species occurring mainly in Wales, south west England, Cumbria and western Scotland. Another rhos pasture specialist was *Microdon mutabilis*. This was already a scarce species, but genetic investigation and work on the larvae has shown that this 'species' is actually two: *M. mutabilis*, found in Scotland, and *M. mymicae*, found predominantly in Wales and south west England. So now this scarce species has become two, each with a reduced range, doubling the challenge for nature conservationists!

Hoverfly research in Wales

My PhD, jointly supervised by Swansea University and the National Botanic Garden of Wales, has been studying the habitat requirements and pollination behaviour of hoverflies in Welsh grasslands. This has involved counting hoverfly numbers in different grassland communities, and relating this to characteristics of the grasslands such as flower abundance and soil moisture. Not surprisingly, the more flowers there are, the more hoverflies you get, and wetter ground increases those whose larvae are semi-aquatic, such as *Eristalis* and *Helophilus* species.

I have also been investigating pollen transport by hoverflies. Thanks to pioneering work at the National Botanic Garden of Wales, Wales was the first country to have a complete DNA barcode library of all its plants (Box 1). I have been washing pollen from the bodies of hoverflies, and extracting and sequencing the barcodes from the pollen DNA to identify which plants hoverflies have been visiting. The results have shown that they are visiting a far wider range of plants that previously thought. It is also giving new insights into the way that pollination networks in grasslands are structured. Pollen transport networks overall appear to be generalised, with pollinators visiting many plants, and plants having many potential pollinators. However, individual insects seem to specialise on a short term basis of perhaps a few hours or a day, visiting the same species repeatedly.

Getting involved in hoverfly recording

There is still lots to learn about hoverflies, and records can be very valuable. Getting to grips with hoverfly identification is not straightforward, but there are lots of resources out there to help (Box 2). Writing in *The Fly Trap*, Fredrick Sjoberg described the pursuit of hoverflies thus: *We are quiet, contemplative people, and our behaviour in the field is relatively aristocratic. Running is not necessarily beneath our dignity, but it is in any case pointless because flies move much too fast. Consequently, we stand still, as if on guard, and moreover almost exclusively in places with blazing sunshine, little breeze, and fragrant flowers.*

George Tordoff

Microdon mymicae

So if you like the idea of visiting nice places in pleasant weather, enjoying

the moment as you wait patiently for your quarry, and learning about some smart insects, hoverflies just might be for you.

__Andrew Lucas__ has worked in nature conservation for over 30 years. He started his PhD on hoverflies in 2011 and, for the sake of his own sanity and that of his family, hopes to submit his thesis in 2016.

BOX 2

Want to know more?

In addition to a net and a pooter, you'll need the standard key - *British Hoverflies* by Alan Stubbs and Steven Falk. Make sure you buy the 2nd edition, especially if picking up a copy second hand. Another very useful book is *Britain's Hoverflies* by Stuart Ball and Roger Morris. This covers all the British genera, and has photographs of key identification features.

Many hoverflies cannot be identified without careful examination under a microscope. You are very unlikely to have any impact on hoverfly populations by collecting them, apart from a few extremely rare species. Insects in general are in more danger from us not knowing where species are, so if you collect, send records to your Local Environmental Records Centre (LERC).

If you have good photographs, you can post them on the UK hoverflies Facebook page for identification by experts. Remember to provide a date, location and grid reference, so your pictures can be turned into records.

And finally, Stuart Ball and Roger Morris run excellent beginner courses at field centres and for LERCs. It's a great way to learn, in the company of two leading UK experts.

Linda Nottage

Volucella bombylans

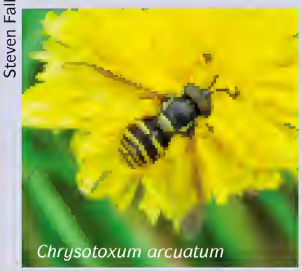
BOX 1

What is DNA Barcoding?

Each species has unique DNA, a code made up of four bases, usually referred to by their initials A, T, C and G. It might seem simple to analyse the DNA to identify a species, but a whole genome can consists of millions of bases – far too much information to use. DNA barcoding was first developed in Canada by Paul Hebert at the University of Guelph in 2003. It uses a standardised section of DNA of about 650 bases that ARE consistent within an animal species but different between species. He coined the 'barcode' analogy from the supermarket codes used to identify products. For his discovery, Hebert was awarded the Order of Canada, Canada's highest civilian honour.

Since then, standard barcodes have also been identified for plants and fungi. A global 'big science' project is now underway to describe the barcode for each species. So far, over a million species have had their DNA sequenced. See *Natur Cymru* 46 pp32-35 for Wales' contribution.

Steven Falk



Chrysotoxum arcuatum

Help gan bryfed hofran

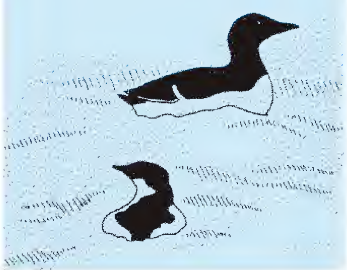
Mae pryfed hofran yn adnabyddus am y ffordd y maen nhw'n dynwared gwenyn a chacwn er mwyn rhybuddio eu hysgyflaethwyr. Mae gan Gymru sawl rhywogaeth nodedig o bryf hofran, fel *Sericomyia superbens* sydd i'w ganfod yn bennaf yn ardaloedd gorllewinol y DU ac yn edrych yn debyg i wenynen bwm fawr. Mae'r larfâu'n byw mewn cynefinoedd amrywiol ac yn bwydo ar gig, ar blanhigion neu ar blanhigion ac anifeiliaid marw. Dim ond neithdar a phaill y mae'r oedolion yn bwyta. Mae peillwyr gwyllt, fel pryfed hofran, yn peillio cnydau'n effeithiol iawn – yn fwy felly na gwenyn mêl – ac yn darparu gwasanaeth sy'n werth miloedd o bunnoedd i dyfwyr. Drwy archwilio DNA y paill sy'n cael ei gario gan bryfed hofran rydym wedi dysgu eu bod nhw'n ymweld ag amrywiaeth llawer ehangach o blanhigion nag a dybiwyd cynt.

Mel Parry

Seabirds as sentinels

Arctic tern *Sterna paradisaea* Môr-wennol y Gogledd

Failure of Arctic tern breeding on the Skerries highlights the role that charismatic seabirds can have as sentinels of less obvious changes at sea. ***IVOR REES*** *also draws attention to some of the critical gaps in knowledge of the pelagic marine ecosystems off Wales*



PHJ

It is often overlooked that true seabirds are almost as intimately linked to marine ecosystems as are sardines or squid. Being rather easier to see, and often to count, than many organisms under the water, they can sometimes be early but indirect indicators of less obvious but wider ecological changes or insidious pollution. In late July 2016, just after the end of the nesting season, there was news that the very large colony of Arctic terns *Sterna paradisaea* on the Skerries, off the north-west coast of Anglesey, failed to fledge young this year. In contrast, the Sandwich terns *Thalasseus sandwichensis* nearby at Cemlyn had another successful year. According to the RSPB, the first indications were that food shortage / starvation was a likely cause of this failure. However, as abnormal numbers of adults were also found dead, other causes such as disease or biotoxins from algal blooms could not be ruled out as contributory factors. Initial post-mortems were inconclusive.

Feeding habits

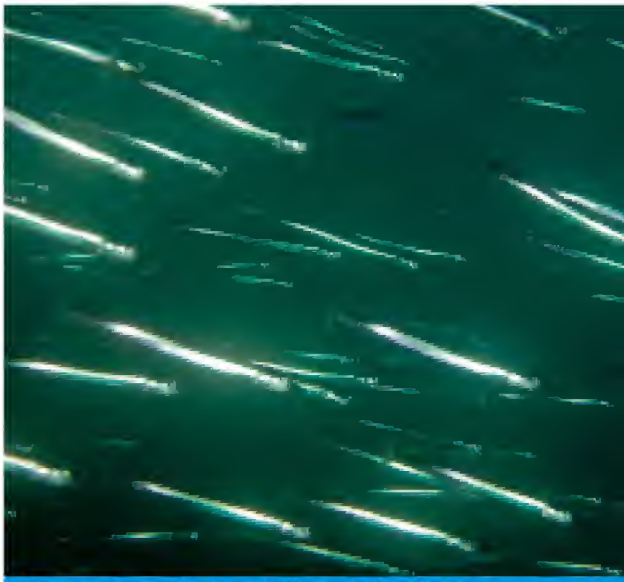
In the breeding season both tern species feed on sandeels to a large extent. In a study at the Skerries in 1997-1999, sandeels made up

95% of the prey brought in by Arctic terns and clupeids (young herring *Clupea harengus* or sprat *Sprattus sprattus*) made up only 3%. At Cemlyn in 1999 Sandwich terns brought in 82% sandeels and 18% clupeids. This is in contrast to some North Sea Sandwich tern colonies where clupeids predominate.

As well as differences in relative proportions of prey, Arctic terns normally take smaller, mainly 1 year old sandeels (avg. c75mm long, wt. 2gm), while Sandwich terns take larger fish (avg. wt. 8gm). Being larger and heavier, the Sandwich terns can also plunge dive to about 1.5m below the surface compared to only 0.5m for Arctic terns. Based on observations elsewhere, there appear to be differences between the terns in their ability to switch to alternative prey if preferred types are lacking. Starvation events occurred in Arctic tern colonies in Orkney, Shetland and the Faroes in the mid 1980s and 1990s, which led to drastic population declines. These events were ultimately attributed to shortages of sandeels after regime shifts in the plankton in parts of the northeast Atlantic. At that time there were no similar breeding failures in the seabird colonies further south in the Irish Sea. Indeed, the Skerries colony had been increasing, with annual productivity, measured as numbers of young fledged per pair, frequently above the replacement rate for stable populations. Terns are relatively long lived, so failure in a single year has less impact than if an oceanographic change persists and there are repeated failures. Only time will tell if the influences on the Irish Sea Arctic terns persist in future years. At Rockabill, off the Irish east coast, the Arctic terns in 2016 were seen bringing in abnormally small fish for their chicks, so some part of the cause may have been widespread in the Irish Sea, if not as severe as off Wales.

Sandeels

At this point in the story we come to rather more uncertainty. In the Irish Sea no less than five species of sandeel are known, of which four may be common or abundant. Taxonomically these belong to three different genera, with mouth structures that imply slightly different adaptations for feeding on small planktonic organisms. All sandeels lay eggs in the sediment, but while some place them in sand others

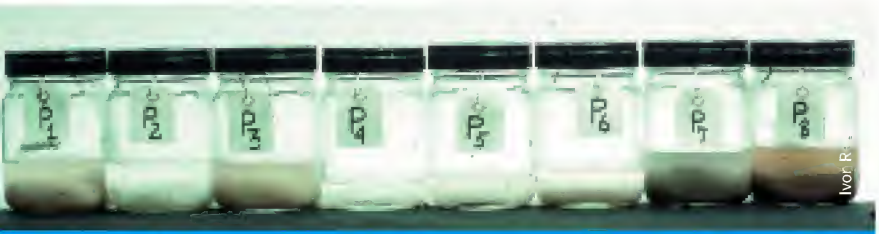

©Paul Kay
There are five species of sandeel known in the Irish Sea

choose shell gravel. So, if a year class failure in sandeels is implicated, which stock might it have been that failed, and where or when might something unusual have caused this? Larval fish surveys by MAFF Lowestoft (now CEFAS) in the 1980s, and later by a consortium of marine laboratories in 1995, showed that in March–May sandeel larvae were found at more than 80% of all the sampling stations spread right across the Irish Sea. Unfortunately it was not practicable to separate the sandeel larvae to species in these spring surveys. A further source of uncertainty is that, unlike the other sandeels, lesser sandeel *Ammodytes tobianus*, which is one of the commonest inshore species, spawns in the autumn.

Plankton in the Irish Sea

Links between the abundance of 1 year old fish and changes to planktonic ecosystems in the relevant parts of the Irish Sea would be difficult to establish, but mismatch between seasonal changes in the plankton and the timing of fish hatching is a well known probable cause of year class fluctuations in commercial species.

Young fish are difficult to sample quantitatively and require dedicated surveys using High Speed Plankton Samplers, instrumented to show volumes of water



Plankton samples taken in summer with the same net, towed for the same duration, and from a series of stations on a transect from near the Irish coast (left) to Liverpool Bay (right). Note the obvious differences in the catches and colour from the amount of phytoplankton.

filtered plus temperature and salinity distributions by depth. The consistent and long-running sampling off Plymouth, by the Marine Biological Association, demonstrated links between pelagic fish abundance and the extent to which slightly different water masses extended into the Western Channel. However, there has been nothing equivalent in the Irish Sea, even using simpler ring nets. The only work approaching long-term monitoring of plankton in the Irish Sea comes from the Continuous Plankton Recorder (CPR) lines run by the Sir Alistair Hardy Foundation for Oceanographic Science (SAHFOS).

This organisation was kept going as an independent foundation after a short-sighted decision to axe research council funding just at the time when links were becoming apparent with climate change. In the Irish Sea the CPR has been most consistently deployed, towed by commercial ships, on the Liverpool-Dublin line. This line happens to cross a discontinuity between the inshore environment of Liverpool Bay and the offshore and slightly more saline waters further west. The frontal boundary often lies off North Wales at about longitude 4° W, so within range of the Skerries.

There are subtle biological differences between plankton populations of inshore and offshore waters that cannot be adequately tied to simple temperature or salinity measurements. Amongst the biological indicators of such water mass quality differences are two of the species of arrow worm (Chaetognaths), *Sagitta elegans* and *S. setosa*. They are distinguished by slight differences in the lateral fin shapes and, of the two, *S. elegans* water is often more productive. Owing to the way CPR operates, it is not practicable to separate them on a routine basis. Nevertheless the CPR data has shown that there has been a large and prolonged decline in the abundance of chaetognaths in the Irish Sea over the last four decades. At one time there was a scheme in the Bangor University Marine Laboratories to regularly collect representative plankton samples from the Menai Strait. Owing to the north-east to south-west residual flow through the Strait, water is drawn from the region of the 4° W discontinuity. Sometimes the plankton samples from the Menai Strait contained mainly *S. elegans* and at others *S. setosa*, apparently depending on the position of the frontal boundary out at sea. Like so many university schemes requiring long-term commitment, it fell by the wayside, so even this simple source of evidence was no longer available when it might have thrown some light on possible ecosystem changes. On a wider scale, it is known that the Irish Sea functions partly as a channel rather than as a separate basin. Microalgae and planktonic copepods are brought in, mainly from the Celtic Sea with the residual northward flow, to seed the populations here. The amount of water mass exchange has been shown to vary both on decadal time scales and with storm surges.

Changes in the phytoplankton

One change to the Irish Sea planktonic ecosystem that is certainly known from the CPR and other sampling has been the widespread occurrence in recent decades of a non-native diatom, *Coscinodiscus wailesii*. This is an unusually large, pillbox-shaped species which at times has been very abundant since it was introduced from the Pacific, probably in ballast water. It first appeared in the English Channel in the mid 1970s before spreading shortly afterwards to the Irish Sea. All the copepods in the Irish Sea plankton, which are key links in the chain between primary producers and higher consumers like sandeels, are small compared to those at higher latitudes. Young fish such as sandeel larvae may start off feeding on nanoplankton, but then probably graduate to feed on the nauplius larvae of copepod species which themselves did not evolve to feed on diatoms as big as *C. wailesii*.

Tim Whitton

Krill *Meganyctiphanes norvegica* are sometimes caught in large numbers when migrating towards the surface at night.

Measuring biotoxins

Around England and Wales, public health monitoring of shellfisheries for biotoxins, such as those that cause paralytic and other forms of shellfish poisoning, showed a 50% increase in the occurrence of *Pseudo-nitzscia* over the five years before 2011. Most of the microalgae which produce biotoxins are dinoflagellates but *Pseudo-nitzschia* is a spicule-shaped diatom which, in high concentrations, may also damage the gills of some small organisms.

Biotoxin production by algae is thought to vary with stress, so there is no direct correlation between the number of cells and the amount of biotoxin. Nevertheless, cell counts high enough to trigger concern were recorded for the numbers of *Pseudo-nitzchia* in several places around the Irish Sea and Bristol Channel during summer 2016. Because the monitoring is concerned with shellfish marketing and human health, the regular sampling by local authorities is just from inlets where shellfish are harvested. There would have been no testing offshore where terns mainly feed. Furthermore, when biotoxins produced by algal blooms have affected seabirds in the past, several bird species have usually been casualties, rather than just one.

Conclusions

When looking for causes of events which may derive wholly or partly from ecological changes in the sea, it is clear that scientific effort put into surveillance of the planktonic environment off Wales has been inadequate. Seabirds can be sentinels, but only if the initial signals they provide are properly followed up.

An example was the case in 1969 when many thousands of auks died in the Irish Sea during the post-breeding moult, and the widespread contamination of marine biota by PCBs was suddenly apparent. With official minds now much occupied with Brexit and devolution of powers to Wales, it must be recognised that with territorial rights come responsibilities for environmental surveillance, especially at sea where citizen science cannot easily go. Continued scientific collaboration with adjoining jurisdictions is essential; one case in point is the monitoring and early warning of toxic blooms, where Ireland has the more comprehensive scheme.

***Ivor Rees** began his career as a fishery scientist and at Bangor University Ocean Sciences laboratories went on to participate in many fundamental and applied studies of the Irish Sea.*

References

1. Cabot, D. & Nisbet I. 2013. *Terns*. Collins New Naturalist.
2. Hinder, S.L. and *et al* 2011. *Toxic marine microalgae and shellfish poisoning in the British Isles: history, review of epidemiology and future implications*. Environmental Health 2011, 10.54 http.//www.ehjournal.net/content.10/1/54
3. Kennington, K. & Rowlands, W. LI. SEA6 Technical Report. *Plankton Ecology of the Irish Sea*. Port Erin Marine Laboratory. http://www.gov.uk/government/uploads/system//SEA6_Plankton_PEML.pdf

Ecosystemau morol

Gall adar môr fod yn ddangosyddion cynnar o newidiadau mewn ecosystemau morol tanddwr. Yn 2016 ni wnaeth môr-wenoliaid y gogledd ar Ynysoedd y Moelrhoniaid fagu unrhyw gywion yn llwyddiannus, yn wahanol i'r môr-wenoliaid pigddu gerllaw. Mae'r ddwy rywogaeth yn bwydo ar wahanol fathau o lymrïaid. Mae pum rhywogaeth o lymrïaid ym Môr Iwerddon: gall asesiadau poblogaeth roi trosolwg o niferoedd llymrïaid ond ni allant wahaniaethu rhwng y gwahanol rywogaethau. Mae llymrïaid, yn eu tro, yn dewis dodwy eu hwyau ar wahanol fathau o arwynebedd ac maen nhw'n bwydo ar amrywiaeth o blancton gwahanol. Gallai newidiadau i unrhyw un o'r rhain effeithio ar boblogaethau môr-wenoliaid y gogledd.

The Grizzled Skipper's fortunes in Wales

Grizzled skipper butterfly *Pyrgus malvae* Gwibiwr brith

Butterfly Conservation recently set out to evaluate the status of grizzled skipper at the largest colony in Wales, at Merthyr Mawr Warren in Glamorgan. ***JUDY BURROUGHS*** *and* ***GEORGE TORDOFF*** *were particularly interested in the butterfly's choice of plants for egg laying.*

The grizzled skipper *Pyrgus malvae* is a small, dark brown and white chequered butterfly which is almost moth-like in appearance and has a characteristic rapid, buzzing flight which can make it difficult to record. It can be seen flying in late spring and occasionally a second brood may emerge in August. Populations are in long term decline: in Wales the species is at the north-western edge of its UK range and is distributed at 23 sites, of which only five support larger colonies[1].

Preferred habitats

Grizzled skipper is generally found in early successional habitats such as chalk or limestone grasslands, post-industrial sites, woodland clearings and rides, and occasionally on sand dunes[2]. It is regarded as a specialist species due to this habitat preference and the selection of only certain members of the rose *Rosaceae* family for egg laying: wild strawberry *Fragaria vesca*, creeping cinquefoil *Potentilla reptans*, agrimony *Agrimonia eupatoria* and, less often, barren strawberry *P. sterilis*, tormentil *P. erecta*, salad burnet *Sanguisorba minor*, bramble *Rubus fruticosus* agg., dog rose *Rosa canina* and wood avens *Geum urbanum*. Larvae initially feed on the plant on which the eggs were laid but,

unusually for a butterfly species, may also switch to another of the plants listed above as they develop[3].

UK population trend and distribution

Over the 39-year period 1976–2014 the UK grizzled skipper population declined by 37% and the species was seen at less than half of its previously known sites (an occurrence change of -53%). However, the picture for the most recent 10-year period (2005–2014) is less dramatic, with no recorded change in overall population and a slight increase in the number of sites where it has been seen (an occurrence change of +7%)[4] .

Grizzled skipper is a Priority Species in England and listed in Section 7 of the Environment (Wales) Act 2016 as a 'species of principal importance'. Butterfly Conservation wanted to find out more about its fortunes in Wales, to identify the most important sites and to inform habitat management for the species.

Distribution

Butterfly Conservation Wales gathered existing species records in Wales and undertook field surveys during 2011-2013. They found grizzled skipper had recent records from just 23 sites in two main areas: along the south coast and in the north-east of Wales. All the colonies are at low density, most are small, and the two largest were estimated as having no more than 100 adults during the peak flight season.

Eight new sites have been discovered recently but one previously known colony has disappeared. Four new sites were found in Monmouthshire where only one was known in 1998, and four in Pembrokeshire where it was previously thought to be extinct. Twenty-three sites compares well with the 14 Welsh sites known in 1975–1998, but the increase is not as encouraging as it sounds because grizzled skipper was acutely under-recorded before 2005. In north-west Wales the species has not been recorded since the early 1980s.

The strongest Welsh colonies were at five sites where the species is widespread over a large area but at low density. The two largest colonies are at Merthyr Mawr Warren (Glamorgan) and Wrexham Industrial Estate (Denbighshire), and there are three intermediate-sized colonies at Pembrey Forest (Carmarthenshire), MoD Caerwent (Monmouthshire) and Llanymynech Rocks (Montgomeryshire). There are six small sites, but at the remaining 12 sites the population status is either uncertain (as there have only been one or two grizzled skipper seen there) or 'unknown', as access for surveys is restricted.

Judy Burroughs

Grizzled skipper egg on the underside of a bramble leaf

Merthyr Mawr

To understand more about its habitat requirements, a study of grizzled skipper's choice of egg-laying sites and larval food plants was conducted in a student project at Merthyr Mawr Warren.

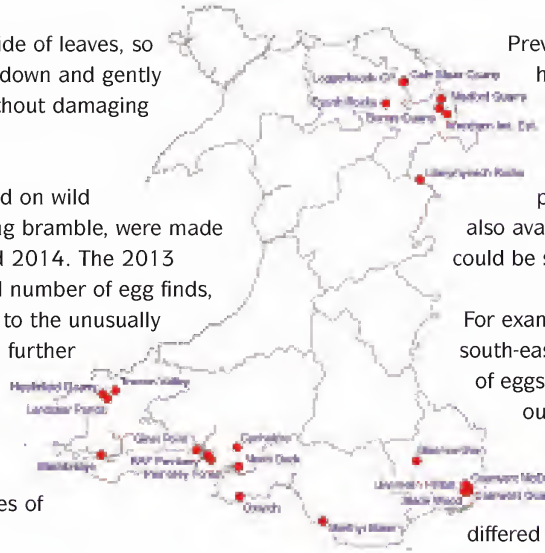
The site is a National Nature Reserve (NNR), within Kenfig Special Area of Conservation (SAC), with a range of successional sand dune habitats from bare sand to stabilised dunes with grass and areas of woodland[5]. Some of the dunes here are spectacular, up to 60 metres high, and the Reserve is of interest for its assemblages of plants, fungi and invertebrates, and its range of habitats, which includes sand-covered limestone cliffs at the landward edge of the site. Survey visits in the spring and early summer were delightful with drifts of flowers, the scent of burnet rose *Rosa pimpinellifolia* in the air, and many butterfly and moth species including dingy skipper *Erynnis tages*, common blue *Polyommatus icarus*, small blue *Cupido minimus*, small heath *Coenonympha pamphilus*, orange-tip *Anthocharis cardomines* and the small argent and sable moth *Epirrhoe tristata*.

Finding the eggs

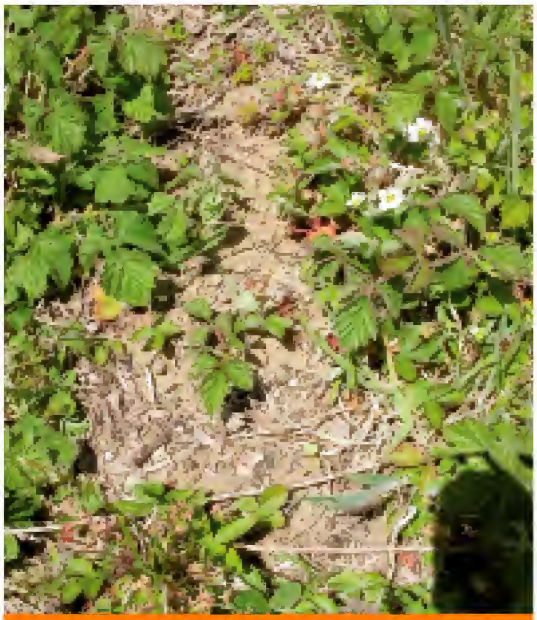
Grizzled skipper eggs are tiny (about 1 mm) and

usually laid on the underside of leaves, so to search one must squat down and gently turn over many leaves, without damaging any eggs.

Searches for eggs, focussed on wild strawberry and low-growing bramble, were made over ten days in 2013 and 2014. The 2013 surveys resulted in a small number of egg finds, which may have been due to the unusually cool and wet weather, and further searches were required in 2014. Random vegetation surveys were also carried out to assess the frequency of the species of potential host plants.



Initially it was thought that wild strawberry would be the main host plant since, of the main host plants found in previous studies, it is the most frequent species at this site. Then the chance find of an egg on a low growing bramble during the initial exploratory period led to the search method being widened to include these plants, although very few eggs had been found on bramble in other studies.



Judy Burroughs

The strawberry plant in the centre bears a grizzled skipper egg

Previous studies at other sites had found eggs on between one and three members of the *Rosaceae* family, even where some of the other potential host plants were also available and different species could be selected at different sites[3,6,7].

For example, on chalk downland in south-east England, more than 90% of eggs were found on two or three out of the eight *Rosaceae* species that were present. The proportion of eggs found on each species differed at each of the sub-sites studied, but where wild strawberry or agrimony were present they carried a disproportionately high number of eggs[5]. In Germany, on calcareous grassland, eggs were distributed at a ratio of about 4:1 between agrimony and spring cinquefoil *Potentilla tabernaemontani*[6].

All the previous studies had found associations between egg finds and the presence of stones or bare ground. In the sand dunes, stone is a rare feature but on the high dune one patch was found with about 40 limestone fragments lying on the surface. At a site in the English midlands[7] grizzled skipper had been found to favour leaves growing next to stones, so a special search was made of the wild strawberry and bramble growing around stones at Merthyr Mawr. A corresponding vegetation survey was made in randomly selected squares (only one of which held a stone) in the surrounding plot, to compare the characteristics of occupied plants with those of unoccupied plants.

Preferred plant species for egg laying

In total 28 eggs were found (with one instance of two eggs 2mm apart on the same leaf which was treated as one 'egg laying choice'). Most were laid on the underside of leaves, 41% (11/27) on wild strawberry and 59% on low-growing bramble species. These plants made up 15% and 85% respectively of a random sample of potential host plants at the site, suggesting that although wild strawberry was less

George Tordoff

The grizzled skipper is known to lay its eggs on plants in the family *Rosaceae*

frequent it was disproportionately favoured over low-growing bramble.

Searches of other potential host plants – agrimony and burnet rose – were made but no eggs were found.

Egg-laying in pockets and mosaics

Grizzled skipper was found to prefer to lay its eggs on plants in 'pockets' of shorter vegetation (mean height 2.3cm) within 0.25m^2 area which in turn is lower (up to 45cm high) than the surrounding vegetation, within a wider mosaic of vegetation of varying heights. Bare sand, stone or dry vegetation litter were often present.

The females may choose patches with taller grasses nearby because the males use taller stalks for roosting and territorial behaviour[3] or they may provide shelter from wind or flying predators.

All eggs but one were found no more than 5cm from the ground on plants up to 10cm tall.

Stones and sand: substrates associated with egg finds

As in previous studies on grizzled skipper, an association was found at Merthyr Mawr between egg finds and the presence of stones or bare ground (sand at this site).

Nine egg finds (33%) were on leaves growing over stone and a further four were found on plants growing next to stones but on leaves over another substrate. It is suggested that further egg surveys are carried out in areas with surface deposits of stones or rock outcrops at Merthyr Mawr as these features may be significant for grizzled skipper on this site.

Other substrates beneath the egg bearing plants were sand (under 37% of host plants, some combined with stone), and moss (25%). These could possibly create a warmer and drier microclimate for the eggs and developing larvae, although temperatures and humidity would need to be monitored to confirm this. Unless there had been recent rainfall, the moss growing on the free-draining sand was observed to be desiccated and dark in colour. However, 21% of the host plant leaves were over other green vegetation such as grass and small herbs.

On the basis of these findings, the study suggested that habitat management for grizzled skipper at this site should aim to maintain and extend areas where eggs are found with a mosaic of bare sand and a herb and grass sward of

Judy Burroughs

The grizzled skipper prefers low vegetation with patches of bare ground for laying its eggs.

varying heights, including both wild strawberry and low growing bramble. Continued light grazing by cattle, aided by rabbit grazing (which create patches of bare sand by digging) is ideal.

Conclusion

This recent work on the grizzled skipper demonstrates its precarious status in Wales. However, as the egg-laying research shows, we now have a good idea what is needed for successful conservation on sand dunes. On brownfield sites work by Butterfly Conservation in England[7] and Butterfly Conservation staff[8] has shown that mitigation for grizzled skipper is feasible, easy to accommodate in set aside areas, and relatively low-cost. This is a butterfly that can live alongside development so long as its needs are considered in the early stages of planning.

__George Tordoff__ has had a lifelong interest in wildlife and has been a Conservation Officer for Butterfly Conservation Wales since 2009. __Judy Burroughs__ works for Butterfly Conservation Wales and has recently completed a study of grizzled skipper at Merthyr Mawr as part of her MSc in Environmental Conservation and Management.

Acknowledgements

The Grizzled Skipper Site Dossier was produced thanks to a Natural Resources Wales grant. Thanks to Dr Rhian Jenkins (University of Wales Trinity St David, Swansea), to Duncan Ludlow (Natural Resources Wales), to Paul Gadsby (Butterfly Conservation volunteer) for his generous help with fieldwork, and to Butterfly Conservation staff.

References

1. Tordoff, G.M., and Williams, C., 2014, *Status of the Grizzled Skipper butterfly* (Pyrgus malvae) *in Wales*, Report No. S14-06, Butterfly Conservation Wales, Swansea.
2. Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G., Jeffcoate, S., 2001, *The Millennium Atlas of Butterflies in Britain and Ireland*. Oxford University Press, Oxford.
3. Brereton, T. M., 1997, *Ecology and conservation of the butterfly* Pyrgus malvae*, (Grizzled skipper) in south-east England.*, PhD. Thesis, University of East London.
4. Fox, R., Brereton, T.M., Asher, J., August, T. A., Botham, M.S., Bourne, N.A.D., Cruikshanks, K.L., Bulman, C.R., Ellis, S., Harrower, C.A., Middlebrook, I., Noble, D.G., Powney, G.D., Randall, Z., Roy, D.B. and Warren, M.S. 2015, *The State of the UK's Butterflies 2015*, Butterfly Conservation and Centre for Ecology & Hydrology, Wareham, Dorset.
5. Countryside Council for Wales Staff, 2002, Site of Special Scientific Interest Citation, Countryside Council for Wales.
6. Kramer, B., Kampf, I., Enderle, J., Poniatowski, D. & Fartmann, T., 2012, 'Microhabitat selection in a grassland butterfly: a trade-off between microclimate and food availability', *Journal of Insect Conservation*, (2012) 16:857–865.
7. Slater, M., 2007, 'Creation of a drystone wall to create egg-laying habitat for Grizzled Skipper *Pyrgus malvae* at Ryton Wood Meadows Butterfly Conservation Reserve, Warwickshire, England', Conservation Evidence, (2007) 4, 35-40
8. Butterfly Conservation staff, 2010, Grizzled Skipper Factsheet, Butterfly Conservation, Wareham (available from http://butterfly-conservation.org/files/grizzled-skipper-psf.pdf)

Y Gwibiwr Brith

Mae'r gwibiwr brith yn hoffi llystyfiant agored sy'n nodweddu cyfnodau cynnar yn ystod datblygiad cynefinoedd. Mae'r glöyn byw hwn ond yn dodwy wyau ar ambell aelod o deulu'r Rhosyn. Oherwydd ei fod mor ddewisiol mae poblogaethau'r glöyn yn dirywio. Yn ystod arolwg diweddar ym Merthyr Mawr cafwyd hyd i 28 ŵy, yn bennaf o dan ddail, gyda 41% ar ddail mefus gwyllt a 59% ar dyfiant isel o fieri. Roedd y glöynnod yn amlwg yn hoffi dail a dyfai dros ben neu'n agos at ddaear noeth a cherrig, o fewn pocedi o lystyfiant byr. Ar sail y darganfyddiadau hyn gallai dyfodol y glöyn byw hwn fod yn llawer mwy llewyrchus pe bai'n cael ei ystyried yn fwy gofalus wrth wneud penderfyniadau cynnar ynglŷn â rheolaeth cynefinoedd.

Tony Pickup

Bywyd gwyllt ynghudd mewn man amlwg; **cyfrinachau Gwastadeddau Gwent**

Cors Magwyr yn edrych tua'r gogledd ar hyd ffos Blackwall tuag at bentref Magwyr a Bryn Wilcrick
Magor Marsh looking north along Blackwall reen towards Magor village and Wilrick Hill

Ar yr olwg gyntaf 'dyw tir gwastad ddim yn edrych mor ddiddorol efallai â llethrau a chopaon. Rhaid mynd i ganol gwlyptir Gwastadeddau Gwent er mwyn gwerthfawrogi cyfoeth yr ardal. ***RICHARD BAKERE*** *sy'n ein tywys drwy hanes a chyfrinachau hynod y gornel unigryw hon o Dde Cymru.*

Yn ne Cymru, rhwng yr afon Wy yng Nghas-gwent, y Rhymni yng Nghaerdydd a'r Hafren bwerus, saif ardal gymhleth a chymysg o dir, dŵr, bywyd gwyllt a phobl. Dydy tirlun hynafol Gwastadeddau Gwent ddim yn gwbl naturiol nac wedi ei greu'n llwyr gan law dyn. Wedi ei ddiffinio ar y cyrion gan gymysgedd o ddaearyddiaeth naturiol a morgloddiau artiffisial, mae'r strwythurau yma yn gwarchod a hefyd yn bygwth bodolaeth y tirlun.

Oddeutu 12,000 o flynyddoedd yn ôl, dechreuodd y gorchudd o iâ a orchuddiai'r tir grebachu. Ar y pryd, roedd y tir sydd bellach yn cael ei alw'n Wastadeddau Gwent yn dwndra gwastad ac yn rhan o gwm isel enfawr gyda'r arfordir agosaf dros 150km i'r gorllewin, y tu hwnt i leoliad Ynys Wair heddiw. Oherwydd cynhesu byd-eang toddodd yr iâ, dechreuodd lefel y môr godi, a symudodd yr arfordir i mewn i'r tir gan ddechrau ffurfio ffurf twmffat nodweddiadol Sianel Bryste.

O ganlyniad i gyfeiriadaeth y sianel enfawr oedd yn datblygu a ffurf y basn llanwol cyfagos datblygodd yr harmonig llanwol cryf sy'n bodoli

heddiw. Mae hwn yn cynhyrchu'r ystod lanwol enwog o hyd at 14m, llif anferthol o gryf sy'n cludo, yn gollwng ac yn ailffurfio miliynau o dunelli metrig o ddŵr a gwaddod ar bob llanw. Roedd ein cyndeidiau'n sylweddoli cymaint oedd grym y dŵr hwn ac wedi'i anfarwoli drwy gyfrwng chwedlau Hafren (Sabrina) a Gwendolen.

Rhwng 12,000 a 2,000 o flynyddoedd yn ôl roedd casgliad o wlyptiroedd oedd yn newid yn gyflym, gan gynnwys coedlannau ffen, ffen mawn, cors hesg, morfa heli a blaendraeth, yn bodoli ar ddwy ochr aber Hafren oedd yn datblygu, gan gynnwys yr ardal a elwir heddiw yn Wastadeddau Gwent a Gwastadeddau Gwlad yr Haf. Dim ond un o'r anifeiliaid mawr oedd yn ecsbloetio ac yn newid y llu o adnoddau i'w hela a'u casglu yn y gwlyptiroedd hyn oedd dyn. Cafwyd hyd i wersylloedd hela o'r cyfnod Mesolithig o amgylch yr hyn oedd yn 'ynys' ddŵr croyw ar y pryd, sef Allteuryn. Yn arwain i ac o'r ynys, gorchuddiwyd llinellau unigol o olion troed dynol o dan laid diweddarach yr aber ers iddyn nhw gael eu gosod yno dros 6,500 o flynyddoedd yn ôl. Ar hyn o bryd mae rhai wedi dod i'r golwg o ganlyniad i erydiad presennol. Efallai bod ein cyndeidiau wedi bod yn mynd i edrych ar eu trapiau pysgod o wiail neu wedi bod yn hela pysgod mewn rhwydi'n union fel pysgotwyr heddiw yn y Greigddu. Mae archeolegwyr hefyd wedi dod o hyd i ôl-troed yr ychen hirgorn, y carw coch a'r garan, aderyn sydd unwaith eto'n galw heibio Gwastadeddau Gwent ar ôl iddo gael ei ailgyflwyno i Wlad yr Haf.

Drwy gydol yr Oes Efydd ac Oes yr Haearn roedd gwartheg yn pori'r morfeydd heli'n ystod yr haf ar ôl cael eu gyrru i lawr o'r aneddiadau a'r ffermydd a sefydlwyd ar ddiogelwch y cyrion tir sych. Y nodwedd amlycaf sy'n ein hatgoffa o'r cyfnod hwn yw'r gaer o Oes yr Haearn ar Fryn Chwilgrug. Heddiw, mae gwartheg yn dal i bori'r morfa heli yn ardal Llanbedr Gwynllŵg.

Tony Pickup

Newidiodd y patrwm hwn o ecsbloetio ar ôl i'r Rhufeiniaid goncro Cymru. Mae'n ymddangos mai llengfilwyr o Gaerllion oedd yn gyfrifol am godi'r amddiffynfeydd môr cyntaf. Y bobl yma oedd yn gyfrifol am hawlio a draenio'r tir am y tro cyntaf i'w ddefnyddio ar gyfer amaethyddiaeth ac wrth wneud hynny crëwyd hefyd y broblem o waredu'r dŵr croyw oedd yn cronni y tu ôl i'r morglawdd. Er bod rhywfaint o'u system ddraenio'n dal i gael ei defnyddio o amgylch Llanbedr Gwynllŵg, golchwyd y morgloddiau i ffwrdd mewn mannau eraill, ac unwaith eto roedd y llanw'n gorchuddio'r tir ddwywaith y dydd, gan gladdu'r caeau o dan hyd at 1m o waddod.

O'r 12fed ganrif, comisiynodd arglwyddi Cymreig a Seisnig y rhan hon o Gymru, a'r mynachlogydd a sefydlwyd gyda'u cymorth hwy, y gwaith o ailgodi'r morgloddiau a chreu system ddraenio newydd. Roedd y tir ffrwythlon a gynhyrchwyd yn enwog am ei laswellt yn y gwanwyn, ei wair a'i gnydau. Mae cymhlethdod a chywreinrwydd y system hon sy'n parhau yn ysbrydoledig. Er enghraifft, rhed Ffos y Mynaich, sy'n cludo'r dŵr glaw gormodol o'r bryniau, ar draws Morfa Gwent ar "bontffordd" uwchben y ffosydd sy'n llifo oddi tani. Cesglir glaw sy'n cwympo ar y ddaear y tu hwnt i'r morglawdd gan gyfres hynafol o strwythurau tebyg i ffosydd bas ar wyneb cae. Yna mae'n llifo drwy adran fer o ddraen pibellog yn y pentiroedd ac i lawr i ffosydd y caeau. Yna mae'r ffosydd caeau yma'n uno i ffurfio'r isafonydd a'r prif afonydd (yn wahanol i afonydd confensiynol) sydd, wedi cyrraedd y morglawdd, yn llifo drwy gaead llanwol i ffos lanwol. Dim ond ar ôl cyrraedd y pwynt yma mae'r dŵr yn peidio â pheri risg i'r ffermydd a'r aneddiadau y tu ôl i'r clawdd. Mae'r iaith a'r derminoleg unigryw a ddefnyddir hyd heddiw'n dyst i'r pwysigrwydd a roir yn lleol ar y strwythurau hyn, a gynhaliwyd gan genedlaethau o dirfeddianwyr lleol dros 1,000 o flynyddoedd.

Cors Magwyr – yr olygfa tua'r de tuag at Barecroft
Magor Marsh – view south over Barecroft

William Watson

Y chwilen ddŵr frenhinol brin *Dytiscus dimidiatus*
King diving beetle

Oherwydd y newidiadau graddol hyn a ddilynwyd gan ganrifoedd o gynnal a chadw sefydlog y cyrsiau dŵr, mae Gwastadeddau Gwent heddiw yn cynnal un o'r casgliadau gorau o infertebratau dyfrol yn y wlad. Mae'r ffosydd amrywiol a'r prif afonydd yn darparu cyfleoedd lu i wahanol rywogaethau. Yn 1963 ffurfiwyd Ymddiriedolaeth Bywyd Gwyllt Gwent i warchod ardal unigryw o fawnog a chyrsiau dŵr ger Magwyr, a sefydlwyd y Warchodfa Natur ar Gors Magwyr. Un rhywogaeth arbennig y system ffosydd yw'r chwilen ddŵr frenhinol Dytiscus dimidiatus (fe'i daliwyd a thynnwyd ei llun gan Will Watson ar ffos y Wal Wen). Dyma chwilen ddŵr fwyaf y DU, ac mae hi'n chwilen drawiadol a dychrynllyd ar yr un pryd. Gan fod pob cae ar draws 5000+ hectar Gwastadeddau Gwent wedi ei amgylchynu gan gwrs dŵr mae yma botensial rhyfeddol i fywyd gwyllt. O blanhigyn fasgwlar blodeuol lleiaf y byd, y llinad diwraidd *Wolffia arrhiza*, i'r ysglyfaethwyr fel neidr y gwair, y crëyr bach a'r dyfrgi, mae arwynebedd ac amrywiaeth cynefinoedd yn darparu cyfleoedd i fywyd gwyllt. Yn drist diflannodd rhywogaethau'n ddiweddar yn cynnwys llygoden bengron y dŵr. Bu i'r rhain ddiflannu o Wastadeddau Gwent o fewn yr ugain mlynedd diwethaf mae'n debyg, a bu'r boblogaeth uchel bryd hynny o finc o Ogledd America'n ormod i'r rhywogaeth llawn cymeriad hon. Ar ôl i griw o wirfoddolwyr ymroddedig sefydlu rheolaeth effeithiol o'r minc, mae llygod pengrwn y dŵr wedi eu hailgyflwyno ar Warchodfa Natur Morfa Magwyr. Maen nhw wedi ffynnu a thros dair blynedd wedi lledaenu cyn belled â Gwarchodfa Gwlyptiroedd Casnewydd (CNC) yn Allteuryn, pellter o 7km o leiaf.

Mewn cydnabyddiaeth o'r amrywiaeth ryfeddol hon o fywyd gwyllt, mae'r rhan fwyaf o Wastadeddau Gwent bellach yn cael cryn warchodaeth, yn cynnwys y dynodiadau SDdGA, ACA, AGA a RAMSAR ond, fel y gwyddom, nid yw'r dynodiadau yma ynddyn nhw eu hunain yn gwarantu gwarchodaeth rhag newidiadau mewn rheolaeth tir neu ddatblygiad.

Boncyn o bridd (wedi ei atgyfnerthu mewn mannau gyda cherrig neu concrid) yw llinell y morglawdd sy'n nodi'r newid o ddŵr croyw i hallt, ac mae'n codi hyd at 8 metr uwchben y ddaear gyfagos. O dan amodau arferol mae'n ymddangos nad oes modd i ddŵr dreiddio drwyddi ond er gwaethaf y gwaith cynnal a chadw parhaus mae dŵr wedi gallu torri drwodd. Un enghraifft eithafol oedd "Llifogydd Mawr" 1607 pan orchuddiwyd Gwastadeddau Gwent i gyd gan gryn ddyfnder o ddŵr, fel y gwelwn yn y nodwyr llifogydd sydd ar uchder y frest ar lawer mur eglwys. Byddai'r difrod o ganlyniad i'r llifogydd wedi bod yn enfawr. O fewn cof mae pobl yn gallu sôn am ddigwyddiadau lle mae'r dŵr wedi torri drwy'r morglawdd, ac rydw i wedi clywed am blant yn cael eu hanfon i'r ysgol ar gefn ceffyl i osgoi dyfroedd y llifogydd!

Er bod codiad yn lefel y môr yn ymddangos yn raddol iawn i ni, mae ei effeithiau wedi cyfrannu at golli morfa heli'n rhannol ar hyd arfordir Gwastadeddau Gwent, oherwydd mae dŵr dyfnach yn galluogi mwy o ynni'r tonau i gyrraedd y cynefin rhyng-lanwol hwn a'i erydu. Gyda'r newidynnau lluosog sef croniant, erydiad, graddfa'r codi a thebygolrwydd llif storm dros dro'n digwydd yr un pryd â llanw astronomaidd uchel mae'n sicr y bydd angen cryn waith cynnal a chadw ar yr "amddiffynfa" hon yn y blynyddoedd i ddod. Mae'r llinell hon o warchodaeth yn debyg o gyflymu graddfa colli'r cynefin morfa heli gan fod ei lwybr naturiol i mewn i'r tir o reidrwydd wedi ei rwystro.

Gyda Chaerdydd a Chasnewydd yn ffinio â'r safle mae cryn bwysau'n cael ei osod ar yr ardal sy'n peri llawer o fygythiadau i fodolaeth pobl a bywyd gwyllt y Gwastadeddau:

- Ehangu ardaloedd trefol a diwydiannol cyfagos.

- Y cynnig am draffordd newydd 23km ar draws Gwastadeddau Gwent a fydd yn mynd i ymchwiliad cyhoeddus yn ystod yr hydref (gweler tud. 42).
- Polisi amaethyddol yn gyrru ffermio ymhellach ac ymhellach oddi wrth ddulliau traddodiadol.
- Yr ansicrwydd anochel ynglŷn â gallu unrhyw amddiffynfa môr i warchod yr ardal.

Wedi ystyried y bygythiadau yma, mae llawer o bobl a chyrff wedi dod ynghyd i ffurfio Partneriaeth y Gwastadeddau Byw, gan obeithio cefnogi'r bywyd gwyllt, y bobl a'r tirlun hanesyddol ledled y lle arbennig hwn.

Mae'r bartneriaeth yn dod ag arbenigedd casgliadol ystod amrywiol o bobl ynghyd ac yn codi proffil Gwastadeddau Gwent. Sicrhawyd ariannu o £321,000 gan y Loteri Dreftadaeth i ddatblygu'r project dros y deunaw mis nesaf a bydd £2.5 miliwn arall ar gael wedi'r gymeradwyaeth derfynol. Nod y project yw gwella cyflwr Gwastadeddau Gwent a'r ddealltwriaeth gasgliadol amdanyn nhw, yn enwedig ei hanes, archeoleg, bywyd gwyllt a mannau gwan.

O ganlyniad i'r project hwn:
- Bydd pwysigrwydd Gwastadeddau Gwent i ddyn ac i fywyd gwyllt yn cael ei ddeall yn well gan bawb sy'n byw neu weithio yn yr ardal ac sy'n dewis mwynhau'r ardal.
- Bydd y tirlun yn cael ei reoli'n well, mewn cyflwr gwell ac yn cael ei gofnodi'n well.
- Bydd pobl wedi datblygu medrau; wedi dysgu am y tirlun a'i dreftadaeth.
- Bydd mwy o amrywiaeth o bobl yn ogystal â nifer yn chwarae rhan ymarferol.
- Bydd yr ardal leol yn lle gwell i fyw, i weithio ynddi neu i ymweld â hi.

Ymysg yr enghreifftiau o beth all y project hwn ei sicrhau i Wastadeddau Gwent mae:
1. Gwell gwerthfawrogiad gan y sawl sy'n byw gerllaw (428,000 yng Nghasnewydd a Chaerdydd yn unig).
2. Ariannu i reoli nodweddion draeniad a gynhelir yn breifat er budd bywyd gwyllt a'r tirlun hanesyddol.
3. Gwell dehongli ar hyd llwybr arfordir Cymru a mannau eraill o ddiddordeb yn cynnwys Gwarchodfa Natur Genedlaethol Gwlyptiroedd Casnewydd, lle mae canolfan ymwelwyr yr RSPB wedi ei gosod yng nghanol gwarchodfa CNC a reolir yn ehangach.

Ar hyn o bryd mae'r project Lefelau Byw yn ei gyfnod datblygu ac yn cael ei arwain gan RSPB Cymru. Mae Rheolwr Datblygu'r Rhaglen, Alison Boyes a'r Swyddog Ymwneud â'r Gymuned, Gavin Jones, eisoes wedi eu penodi. Fe fyddan nhw'n gweithio i ddatblygu cam nesaf y project, gan arwain at esblygiad parhaus yr ardal ryfeddol hon.

*Mae **Richard Bakere** yn ysgrifennu o ganlyniad i'w waith fel Prif Swyddog Gwarchodfeydd gydag Ymddiriedolaeth Bywyd Gwyllt Gwent.*

Yn rhan o Bartneriaeth Gwastadeddau Byw mae'r Gymdeithas Frenhinol er Gwarchod Adar (y corff arweiniol), Ymddiriedolaeth Bywyd Gwyllt Gwent, Cyfoeth Naturiol Cymru, Cyngor Dinas Casnewydd, Cyngor Sir Fynwy, Cyngor Dinas Caerdydd, Rick Turner (archeolegydd), Amgueddfa Straeon Caerdydd, Sustrans, Ymddiriedolaeth Genedlaethol, Ymddiriedolaeth Cadwraeth Cacwn, a Buglife.

Supported by The National Lottery
Cefnogwyd gan Y Loteri Genedlaethol

Secrets of the Gwent Levels

Since the last ice sheet retreated people have colonised the Gwent Levels, hunting and fishing, and grazing cattle on the saltmarsh. Over the centuries they have built sea defences, draining and reclaiming land for agricultural use. The complexity of the salt and freshwater systems has given rise to a unique terminology for the earthworks, floods and drains which is still in use today. This diverse habitat provides a home for a rich variety of wildlife, including many aquatic invertebrates such as the UK's largest water beetle *Dytiscus dimidiatus*. Mink, which destroyed the water vole populations, are now under control and water vole reintroduced to Magor Marsh. Despite being protected by many designations, the levels are under threat from urban expansion and a 23 km stretch of new motorway (see page 42). The new Living Levels Partnership hopes to work together to safeguard this unique area.

A translation of this article is available on request or on our website www.naturcymru.org.uk

All photos: Jonathan Briggs

Welsh canals revisited

In an article in 2004 (NC 13), JONATHAN BRIGGS outlined the natural history interest and conservation problems of the Montgomery Canal. Much water has flowed under the canal bridge since then, not least the 2012 transformation of British Waterways into a new charity, the Canal & River Trust. So what is now happening on the Montgomery Canal and what is the ecological situation on other canals in Wales? Jonathan returns to the story of Wales' wildlife-rich canal heritage and suggests ways to influence canal management.

Monmouth and Brecon Canal with hemlock water-dropwort fringe

The creation of a charitable trust to replace British Waterways (BW), the canal authority, had been on the cards for many years. BW was a public body with considerable liabilities and Government was keen to get it 'off the books'. The Canal and River Trust (CRT) has taken on all BW's canals and property in England & Wales and is expected to become self-funding in due course[1]. Liabilities are considerable – 2000 or so miles of historic (and often crumbling), water-filled engineering structures. The Trust was given a significant dowry and a considerable waterside property portfolio but will be relying increasingly on new support of all kinds, ranging from donations through to volunteering. It is already very people-focused, a significant change from the old BW.

CRT's structure is a little confusing, with a plethora of advisory groups as well as staff. At local level a group of advisors make up a 'Partnership' shadowing on-the-ground Waterway management teams. Wales is served by two cross-border management teams and Partnerships; North Wales and Borders Waterways team in Northwich, and South Wales & Severn Waterways in Gloucester. It also has a small

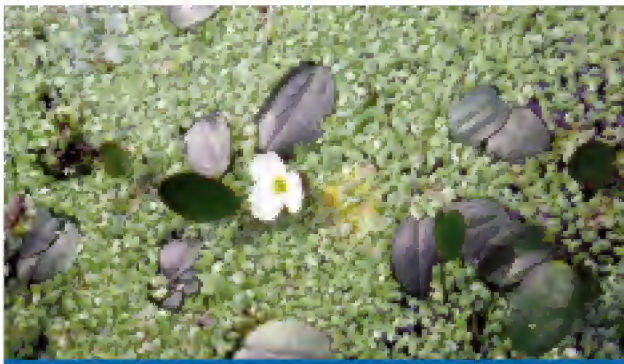
strategic team for Wales, based in Govilon. I'll say a little more about this structure later, but first it would be useful to review Welsh canals and their wildlife.

Canals and wildlife

Canals are entirely artificial; they are engineering structures with a slow-flowing water channel and towpath, originally built to carry freight. It is that artificiality that gives them their natural history value, the unusually stable water levels being a perfect environment for many aquatic plants (macrophytes) and invertebrates. The engineered banks are wonderful for a thin but varied emergent fringe, and the adjoining towpath (often with hedge) can provide very diverse grass verges. These habitat strips, though narrow, can go on for miles, making canals very attractive to foraging species like bats. At the time of writing, June 2016, the Monmouth & Brecon Canal is resplendent with a continuous towpath fringe of hemlock water dropwort *Oenanthe crocata* in full bloom, crowded with hoverflies.

Not all sections have such diversity of course. The underlying engineering structures may be repaired with materials unsuitable for wildlife, the channel may be so full of propeller-driven leisure craft that it is too turbid for macrophytes, and the towpath may be surfaced as a multi-user path. Conversely, canals with no repairs, no boat traffic and little footfall may lose some of their biodiversity through vegetation succession, becoming dominated by reed sweet grass *Glyceria maxima* or simply over-shaded by trees.

Hemlock water-dropwort *Oenanthe crocata* (cegiden y dŵr) and arrowhead *Sagittaria sagittifolia* on the Monmouth and Brecon Canal



Floating water plantain *Luronium natans* in duckweed

Canals cannot survive without management, and ecological needs should be built into that management. BW's record was varied: despite ambitions for canal-by-canal biodiversity plans, it never achieved strategic ecological management.

Montgomery Canal

All canal types, from heavily used right through to neglected and overgrown, occur in Wales, but ecologically the most interesting is the Montgomery, considered by many to be the most biodiverse canal in the UK. Most (about 40 km) is in Wales, from Llanymynech up the Severn valley to Newtown. The canal's ecological interest, well-documented since the 1950s, includes an unusual diversity of aquatic macrophytes and invertebrates (including over a dozen species of dragonfly) in the channel, as well as significant diversity along the banks. It is SSSI and SAC for most of its length; the SSSI recognising the overall diversity and some rarities, and the SAC primarily for the presence of floating water plantain *Luronium natans*. The canal may be the best site in the UK for this delicate species, as well as for grass-wrack pondweed *Potamogeton compressus*.

This biodiversity relies on the canal being un-navigated, and so is threatened by the ongoing programme to restore the canal for leisure traffic. A long-standing legal arrangement exists for offline aquatic reserves to be created as restoration progresses, with the reserves acting as proxy for the canal channel.

This ambitious reserves programme began in 1985, but had a somewhat chequered history, with

Curled pondweed *Potamogeton crispus*

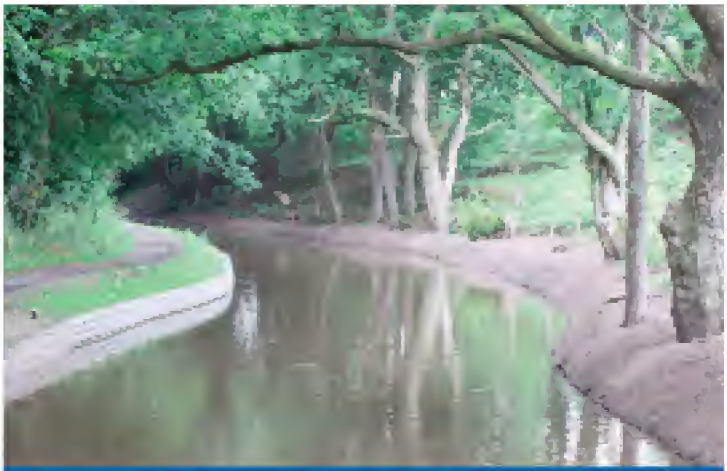
undersized and neglected sites, until a Conservation Management Strategy in 2005[2]. This was based on the original 1985 vision but it secured binding commitments from all parties involved. Restoration progress since has, ironically, been slow, with large-scale works yet to begin. A recent review[3], by the restoration partners (including the Wildlife Trusts, Natural Resources Wales and Natural England) defines four sequential phases. Phases 1 and 2 are in Shropshire, and will take about five years to complete. Phases 3 and 4, which include significant engineering works, are in Powys. Major works in Wales may not take place for some time.

Total project costs, even with volunteers, are likely to be over £30 million. The reserves alone may cost well over £8 million. That figure may seem, in the context of nature conservation in general, astonishingly high, but sums of this order are normal for canal restorations.

Meanwhile, irrespective of that phasing, the canal and the existing reserves have to be managed. Current problems in the canal itself include colonisation by alien plants, particularly water soldier *Stratiotes aloides* in the sections south of Welshpool, and also fringed water lily *Nymphoides peltata* in other sections. Eutrophication and poaching by cattle are also a problem.

Touring the reserves in August 2015, I was dismayed at the relatively unmanaged state of some of them. Limited aquatic interest was present, but many were rather overgrown or over-shaded – water plants need maximum light. They were not the intensively managed sites they were designed to be in the 1980s. This year I'm assured that new management, largely by volunteers, means they are now correctly

Invasive *Nymphoides peltata* in the Montgomery Canal, 2015



Relining of the Montgomery and Brecon Canal at Llangynidr could have included marginal vegetation with a little more care

managed, though this is best assessed in late summer when pondweeds are at their peak.

This year a Stage 2 Lottery Bid was submitted to help fund Phase 1 works. It will allow more reserve creation, channel relining and dredging in Shropshire, plus some work in Wales to help combat emergent overgrowth and ease water flow. It should also help with the control of water soldier.

Monmouth & Brecon Canal

This canal, though completely different to the Montgomery, has wildlife value and potential worthy of wider attention. It includes canals that originally ran from Brecon, via Pontymoile, to Newport. At present there are 50 km of navigable canal from Brecon, hugging the contours of the Usk valley, to Llanfoist where it swings south (forming the National Park boundary) to Pontypool.

Isolated from the wider canal network, it has relatively light boat traffic. Despite this there is limited ecological interest in the main channel due, in part, to a shallow cross-section exaggerating traffic impacts. Much of the channel was restored, from the 1960s onwards, to a design that did not envisage ecological needs. In-channel vegetation occurs, notably clumps of arrowhead *Sagittaria sagittifolia* here and there.

Limited aquatic interest is made up for by wildlife on the banks, towpath and corridor. The well-vegetated towpath provides a continuous habitat strip and the canal is known to be of particular value for foraging and 'commuting' bats, including lesser horseshoe *Rhinolophus hipposideros*. Bats roost in many of the bridges, aqueducts and limekilns along the route. The canal is a huge contributor to the overall biodiversity of the Usk valley and, as much channel rebuilding is planned, could soon add more.

The existing channel structure needs major repairs: it has many leaks, each with potential to wash out the underlying structure. Bank failures, like the one at Gilwern in 2007, are increasingly likely so CRT, which considers the canal to be its highest risk asset, is actively monitoring hundreds of leaks. It plans to reline about 20 km, a project which, with thoughtful design, could include significant ecological gain.

However, last winter's relining at Llangynidr omitted marginal vegetation, apparently due to width restrictions. A modest strip of pond sedges *Carex riparia* or *C. acutiformis* should surely have been possible (they are well-behaved, non-invasive marginals) but it was not to be. I'm assured that future relining will be better, partly because new ecological assessment has identified this as a need but also because this may be a funding condition.

That ecological assessment, by CRT ecologists and volunteers, is a move towards more strategic ecological management. It identifies a need for vegetated margins over several kilometres and advocates renewed hedging and hazel coppicing along towpath margins.

Other Welsh canals

There are many other canals in Wales worth mentioning, albeit briefly. In the north the cross-border Llangollen Canal, managed by CRT, is not generally considered to be wildlife-rich as it is heavily boated and often has very turbid water. Plus, due to

Frogbit *Hydrocharis morsus-ranae* at Wern reserve on the Montgomery Canal, 2015

the mix of boat wash and a precarious position clinging to the edge of the Dee valley, it is rather heavily engineered with exposed steel piling and concrete, even on the length designated a World Heritage Site. Despite this it does have some ecological value and, of course, potential for much more.

Many of south Wales' canals were lost through abandonment or being built over. Significant survivors include the Neath and Tennant Canals, both still owned by the original canal companies. Their survival is due largely to their continued use for water supply. CRT owns the remnants of the Swansea Canal (just 8 km of the original 27 km).

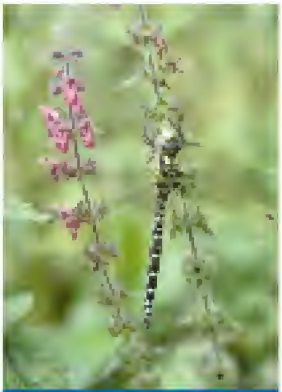
The Glamorgan Canal (not CRT), which ran from Merthyr Tydfil to Cardiff, has mostly gone but there are isolated sections in water. Part is a Local Nature Reserve and SSSI near Tongwynlais, and at Nightingales Bush another section was a Wildlife Trust Reserve until 2008. Remnants of the Aberdare Canal, which ran from Aberdare to join the Glamorgan Canal at Abercynon, include a section at Cwmbach that was also once a Wildlife Trust Reserve.

CRT's governance and ecological approach

CRT is a young organisation, still maturing in many areas, including ecology. Wildlife features strongly in its marketing, but in a fairly superficial way. At governance level, ecological concerns seem to be missing, with just one wildlife advocate on the 35 member Council. At local level the two advisory Partnerships in Wales also have little wildlife input. Most ecological advocacy is from CRT's ecology staff, based in local management units. It is they who push most for ecological gain, backed up by conservation legislation and CRT's status as a public body (inherited from BW) with a duty to further biodiversity. In Wales that duty has recently been re-stated in the Environment Act 2016.

Montgomery Canal 2015: open water with macrophytes

Their voices are not always heard. They may fall foul of a management mindset expecting just 'the legal minimum'. Much everyday management (e.g. towpath mowing, dredging etc) is undertaken by external contractors on national contracts, not by CRT staff. And most major engineering works are undertaken via a national engineering-focused asset management system. This set-up inevitably compromises practical biodiversity vision, with


Dragonfly *Aeshna cyanea*

many people and teams each working to differing agendas.

The involvement of more people with an ecological background would be an advantage. There is plenty of scope, as CRT is actively encouraging individuals and groups to get involved. On the Monmouth & Brecon for example, the Llangattock Community Woodland Group has 'adopted' some CRT-owned woodland.

It also helps to be assisted a little by Government. The most promising initiative for canal ecology in Wales is an 'Environmental Prospectus' concept being developed by CRT's ecologists, detailing ecological aspirations for each of their four Welsh canals. The recent ecological appraisal of the Monmouth & Brecon is a start, but CRT's ecologists' plan is to take it further this year, helped by funding from the Welsh Government which wants to 'optimise outputs' from Welsh canals.

This project echoes biodiversity plan ambitions and will result in plans that should influence major repairs as well as maintenance, and draw in volunteers and 'canal adopters' too. If it works, the concept might be rolled out across the rest of CRT – so Wales may be taking the lead.

Influence and involvement

You might expect ecological management to be covered in-house using CRT's own resources (especially the Montgomery Reserves, a concept established as BW's responsibility over 30 years ago). But CRT increasingly relies on volunteers, and getting involved may be the best way to improve what gets done.

There is ample scope for more external lobbying at all levels. The two advisory Partnerships in Wales would certainly benefit from a little ecological prodding now and then. They sometimes have vacancies, so perhaps people with ecological backgrounds should apply.

Canals represent an extraordinary fusion of natural and industrial history which, though complementary, can be difficult to reconcile, especially with additional pressures of leisure use. CRT is still feeling its way in dealing with these issues and it is crucial that the nature conservation message comes not just from within, but from outside too. Contact details for staff and Partnerships are available online at canalrivertrust.org.uk.

Acknowledgments

Thanks to various CRT staff who took time out of their schedules for discussion. Views expressed are entirely my own.

***Jonathan Briggs** is a freelance ecological consultant. He worked for British Waterways from 1985 to 2006, promoting ecological practice and awareness.*

References

1. Briggs, J., 2012. Canals under new management - A review of wildlife value, issues and opportunities. *British Wildlife* 23: 314-323.
2. *Montgomery Canal Conversation Management Strategy*. 2005. Available online at https://canalrivertrust.org.uk/media/library/186.pdf
3. *Montgomery Canal Restoration Strategy*. 2016. Available online at https://canalrivertrust.org.uk/refresh/media/original/28659-the-montgomery-canal-restoration-strategy.pdf

Bywyd Gwyllt Camlesi

Mae natur artiffisial camlesi yn golygu eu bod nhw'n cynnig amodau anarferol o sefydlog ar gyfer nifer o blanhigion a chreaduriaid di-asgwrn-cefn sy'n tyfu a byw mewn dŵr. Maen nhw hefyd yn goridorau ardderchog sy'n galluogi bywyd gwyllt i symud o fan i fan. Rhaid gweithio'n ddyfal i gynnal ymylon camlesi mewn cyflwr da. Heb reolaeth briodol gall camlesi gael eu mygu gan dyfiant a diflannu dan gysgod trwchus. Ar y llaw arall gall gormod o brysurdeb, o ran cychod a phobl, fod yn niweidiol i nifer o rywogaethau. Ers 2012 mae Glandŵr Cymru yn gyfrifol am reoli camlesi, gyda chymorth gwirfoddolwyr. Mae angen rhagor o ecolegwyr i helpu sicrhau safonau ecolegol uwch wrth gynnal a chadw'r camlesi.

Ray Woods

Welsh Rust Fungi – the case for conservation

Oak rust fungus *Cronartium quercuum*. Rarely reported but probably widespread in Wales

Wales now has a Red Data Book of Rust Fungi – possibly a world first. ***RAY WOODS*** *describes their life stories and ecology, and explains why we should care for these parasitic fungi.*

If you have fur or feathers everyone loves you and wants to conserve you. Fungi, however, have been largely overlooked. If you are unfortunate enough to be a parasitic fungus you have been left decidedly on your own. That was until recently, when a small band of Welsh mycologists remedied the situation by pooling their accumulated knowledge of one of the larger groups of parasitic fungi – the rusts.

The Kingdom of the Fungi is a diverse one. Hawksworth[1] calculates that there are at least 1.5 million species worldwide, with at least 12,000 in Britain, though probably far more await discovery. For the most part little direct action has been taken to conserve them. Nearly 4,000 species of fungi recorded from Britain and Ireland have not been seen for over 50 years. If they were in any other group of organisms these species might now be considered extinct. Such a level of loss or ignorance would not be tolerated in flowering plants, birds or mammals.

We forget fungi at our peril

The fungi are in many respects the forgotten Kingdom of the living

world, yet we derive immense benefits from them. Fungi provide us with some of the most widely employed pharmaceuticals. The contribution they make to our food is immense. Not just the delicious mushrooms but our daily bread, beer, wine, many cheeses and most pickles are dependent on the products of fungi. They form mutualistic associations with almost all of our grazing farm animals, our timber trees and crop plants. They can also cause trouble. Our incautious attitude towards the movement of plants from one continent to another has inadvertently transferred parasitic fungi that have then devastated native plant populations. We are now facing a massive clean-up bill from the probable death of many ash trees due to the failure to exclude or control the ash die-back fungus, not to mention the biodiversity and cultural losses. Ignorance of fungus-like organisms and fungi can come at a very high price.

Ray Woods

The rust fungus *Gymnosporangium confusum* shuttles between two hosts. The orange teliospores on *Juniperus sabina* (above) germinate to produce spores that infect hawthorn (below) which, following two spore stages, re-infects juniper.

Wales – a land rich in rust fungi

Rust fungi are parasites of flowering plants and ferns. They can produce up to five different types of spore in completing their life cycle, most of which are in shades of brown or orange, hence their resemblance to rusty iron from which they get their common name. They are cousins to the mushrooms and toadstools and 260 different rust species have been recorded from Britain. As a result of recent intensive field surveys in Wales (over 100,000 records have been made from the three most intensively studied vice-counties alone) and a search of the literature by a small but dedicated band of amateur field workers, one of the most detailed pictures of the diversity and range of rust fungi anywhere in the world has been assembled[2]. Considering Wales only occupies 11% of the area of Britain, it supports a remarkable 199 different species, 76% of the British mainland total. They have been recorded growing on over one in three, 394 species, of native Welsh wild plants.

Ray Woods

D A Evans

Melampsora arctica on dwarf willow, Snowdonia

Some rust fungi need two completely different host plants to complete their life cycle. Black stem rust, for example, alternates between barberry *Berberis vulgaris* and grasses. Other examples from Wales include rusts that alternate between juniper *Juniperus communis* and rowan *Sorbus aucuparia*; orchids (eg. *Dactylorhiz*a spp.) and willows *Salix* spp.; dog's mercury *Mercurialis perennis* and poplars *Populus* spp.; honeysuckle *Lonicera periclymenum* and red fescue grass *Festuca rubra*; and sedges *Carex* spp. and thistles *Cirsium* spp.

One recent arrival to Wales has a surprising abundance on hedges around Hay-on-Wye. During this year's Hay Festival, hawthorn *Crataegus monogyna* shoots were turned orange by the abundance of spore-producing structures of the rust *Gymnosporangium confusum*. The spores will have come from a dwarf, non-native juniper, presumably in some garden or ornamental planting nearby. Earlier in the year the impressive, bright orange, horn-like spore-producing structures were found for the first time in Wales on a juniper *Juniperus sabina* in a garden in Newbridge-on-Wye, Powys. The horticultural trade has probably inadvertently introduced 23 species of rust fungi to Wales, including rust on carnations, antirrhinums, hollyhocks, mallows, daisies, *Heuchera*, pears, junipers, *Oxalis* species and chrysanthemums. We have recently acquired a rust on alders *Alnus* spp., possibly originating from Japan, that turns the undersides of our native alder leaves bright orange and must reduce their vigour.

Most rust fungi are highly host-specific. A few, however, have been recorded from a surprising number of host species. First prize probably goes to *Coleosporium tussilaginis* recorded from 26 different hosts in Wales, including harebell *Campanula rotundifolia*, eyebright *Euphrasia* spp., Scots pine *Pinus sylvestris*, groundsel *Senecio vulgaris* and coltsfoot *Tussilago farfara*. However, cross-infection from one species of host to another may not occur since host-specific races of rust have developed. A recent notable example is a rust species that lives on cow parsley *Anthriscus sylvestris* and its relatives. Only half a dozen records have been traced of this rust on native species in Wales despite the abundance of potential hosts. Yet recently the rust was observed to sweep across Wales infecting almost every plant of sweet cicely *Myrrhis odorata*. Even where sweet cicely was found heavily infected, there was no sign of infection on adjacent cow parsley. In conserving rusts we need to be aware of their often precise host specificity. We now have records of over 1,000 different rust/host interactions in Wales.

Conserving rust fungi

Did I really suggest we should be conserving parasitic fungi? To understand why, we must look at the role they play in nature. Since all rust fungi are plant parasites, some probably play a significant role in influencing the composition of vegetation.

Zadoks[3], for example, demonstrated the important role that rust and other pathogenic fungi play in modifying the species-composition of salt marsh vegetation in the Netherlands. Plants introduced to new continents without their rust fungi, such as bramble *Rubus fruticosus* in parts of Australia, have rapidly grown to pest proportions not seen in their native, rust-rich home territories. The introduction of rust fungi from their native home has helped to control them. In Britain, field trials have commenced to evaluate the efficacy of a non-native rust as a possible control agent for the introduced Himalayan balsam *Impatiens glandulifera*.

During the course of the collection of data from Wales an increase in abundance of black stem-rust on ryegrass and barberry was noted, probably attributable to particularly warm summers. This grass is at the centre of livestock-production in Wales. Unless additional resistance can be bred into ryegrass *Lolium perenne,* in a warming climate we could see this rust causing economic losses. Stripe rust *Puccinia striiformis* is also becoming increasing common on cereals. Genes conferring resistance to many rust fungi may already be present in the wild plant populations but they are unlikely to persist in plants if those with resistance are not regularly selected for by the challenge of infection. Lose the rust fungi and we may lose the genes for resistance.

Since it can cost up to £200 million and take more than ten years to bring a new chemical crop protection product to market[4], it is easy to see why resistance genes bred into a crop plant can be a very cost-effective alternative option. Biocontrol of rust fungi in crop plants by employing fungi, bacteria or mycoviruses parasitic on rust fungi offers considerable promise[5]. By conserving rare wild rust fungi we may inadvertently be conserving organisms that are potentially effective biocontrol agents. There is a distinct probability that the rarer the rust taxon, the more likely it is to support debilitating hyper-parasites. Their presence may be keeping the wild rust in check.

So conserving rust fungi may not be a bad idea after all. As we place ever more pressure on land, the area and connectivity of species-rich, semi-natural habitats declines in Wales and with it the rust fungi. Acid rain and a changing climate pose threats to even such apparently unspoiled habitats as mountain cliffs. Research at the Royal Botanic Gardens, Edinburgh[6], is investigating possible climate-induced changes to rust species infecting arctic-alpine willow species. One of its most interesting discoveries was that of the rust *Melampsora arctica* on the dwarf willow *Salix herbacea* high up in Snowdonia and on Pumlumon in Ceredigion, previously unreported from Wales. The future of both rust and host in a warming climate must be uncertain. Greater fragmentation of habitats may also reduce the survival of those rusts that require two completely contrasting host species in order to complete their life cycle.

A Red Data Book and Census Catalogue of Welsh rust fungi

Having collected all the distribution information currently available on rusts in Wales it was decided to use the internationally accepted criteria of the IUCN to create a Red Data Book (RDB) and present the distribution data as lists of taxa recorded from each of the Welsh vice-counties as a Census Catalogue[2]. So how are Welsh rusts faring, considering that so little was known of them in the past that they were never taken into account in acquiring and managing nature reserves and in selecting Sites of Special Scientific Interest?

Five rusts appear to have become extinct in Wales, having not been seen for over 50 years. All their host plants persist, but for three of them only in very small numbers and with fragmented populations. The latter group occurred on spiked speedwell *Veronica spicata*, Nottingham catchfly *Silene nutans* and wild celery *Apium graveolens*. In complete contrast we seem to have lost the rust on hogweed

P A Smith

Purple moor-grass/selfheal rust *Puccinia moliniae* on purple moor-grass

Heracleum sphondylium, a plant of increasing abundance. Twelve rust species are Critically Endangered and 17 are considered to be Endangered. The habitats they occupy in decreasing abundance are fen and marshy grassland, upland heath and cliff, woodland and woodland edge, and coastal habitats. In addition 13 species are considered to be Vulnerable.

Is there a relationship between the rarity of the host and that of the rust? Out of the 50 host species on which the 43 rust species now considered threatened in Wales occur, only one is considered threatened in Wales[7]. The RDB host viper's-grass *Scorzonera humilis* occurs in a single Welsh site and supports a good population of its RDB rust. In its only other British populations in Dorset, only tiny amounts of rust have been found and a survey this year (2016) failed to find any. So, relying on the conservation of threatened plants to conserve threatened rusts is unfortunately not going to help the rust fungi, since few support RDB rust species.

As natural habitats become more fragmented, are those rusts that alternate between two distinctly different hosts more threatened? Surprisingly this is not the case in Wales, since a slightly smaller proportion of rusts with an alternating life cycle are considered threatened compared to the total rust populations. In terms of related groups of organisms, 19% of Welsh rust fungi species are placed in a threat category compared to 16% of lichens[8], 18% of bryophytes[9] and 17% of flowering plants[7].

Rust hunting

With recording effort rather unequally spread across Wales, it is not entirely clear where are the best areas to find rust fungi. The vice-counties of Carmarthenshire and Caernarvonshire top the diversity list, with 164 and 162 rust species respectively. Both have a great range of habitats from sea shore to montane summits, and a highly diverse flora. However, all the other vice-counties in Wales can claim in excess of 100 species. High quality habitats such as fens and montane cliffs can be rich in rusts, but so also can brownfield sites and road verges. Wherever you are, it is worth searching for them. The hogweed rust, possibly extinct in Wales, was recently found in the Marches near Ludlow, not far, as a rust spore could travel, from the Welsh border. We have yet to record a distinctive rust that produces conspicuous brown spore patches on the leaves of purple moor-grass *Molinea caerulea* and alternates with selfheal *Prunella vulgaris*. Surely this rust should be present in Wales, a land becoming infamous for its square miles of purple moor-grass? Next time you collapse after stumbling over one of its tussocks, check it out for rust fungi! To help with identification the late Douglas Henderson[10] has provided an excellent simple guide to rust fungi based on their hosts.

Fungus hunting can add interest to any walk in town or country and can even be rewarding in the aisles of a garden centre. Mycologists at the Royal Botanic Gardens Kew are leading a project entitled the *Lost and Found Fungi* (see http://fungi.myspecies.info/content/lost-found-fungi-project) encouraging us all to seek out 'lost' fungi. They provide good images, tips on identification, and hints on where to look. Fungi could well be Wales' most beneficial and under-used natural resource. We should all help to realise their potential so that they can never again be described as 'the forgotten kingdom'.

Acknowledgements

I am indebted to the many recorders who have shared their records and in particular to Nigel Stringer, Debbie Evans, Arthur Chater, Paul Smith, Gareth Griffith and Bruce Ing for both their records and their wise council and support.

***Ray Woods** has now retired from a long career devoted to conserving Welsh biodiversity, formerly as Area Officer for East Wales and specialist adviser on*

lower plants and fungi to the Countryside Council for Wales, and latterly as the Welsh officer for lower plants and fungi of the plant conservation charity Plantlife.

References

1. Hawksworth, D.L. (2001). The magnitude of fungal diversity: the 1.5 million species estimate revisited. *Mycological Research* 105 (12), 1422-1432.
2. Woods, R.G.,Stringer, R.N., Evans, D.A. & Chater, A.O. (2015). *A Rust Fungus Red Data List and Census Catalogue for Wales*. A.O. Chater, Aberystwyth and www.aber.ac.uk/waxcap/downloads/Woods15-RustFungusRedDataListWalesRev1.pdf.
3. Zadoks, J.C. (2005). Sea lavender, Rust and Mildew. A perennial pathosystem in the Netherlands. Wageningen Academic Publishers. The Netherlands.
4. http://www.rothamsted.ac.uk/intopractice/Fungicide ResistanceReport.pdf
5. Moricca, S., Ragazzi, A. & Assente, G. (2006). Biocontrol of rust fungi by *Cladosporium tenuissimum*. In Pei, M. H. & McCracken, A.R. (eds.). *Rust Disease of Willow and Poplar* pp. 213-229. CABI Publishing, Wallingford, Oxfordshire.
6. Scottish Montane Willow Research Group (2005). *Biodiversity: taxonomy, genetics and ecology of sub-arctic willow scrub*. Royal Botanic Gardens, Edinburgh.
7. Dines, T.D. (2008). *A Vascular Plant Red Data List for Wales*. Plantlife International, Salisbury.
8. Woods, R.G. (2010). *A Lichen Red Data List for Wales*. Plantlife, Salisbury.
9. Bosanquet, S.D.S. & Dines, T.D., (2011). *A Bryophyte Red Data List for Wales*. Plantlife, Salisbury.
10. Henderson, D.M. (2004). *The Rust Fungi of the British Isles. A Guide to Identification by their Host Plants*. British Mycological Society, Kew. Available as download on: http://www.aber.ac.uk/waxcap/downloads/Henderson2004-BritishRustFungiHostPlantGuide.pdf

A oes angen gwarchod y gawod goch?

Mae 'na dueddiad i anwybyddu ac anghofio am ffyngau ond maen nhw'n chwarae rhan bwysig yn ein bywydau. Mae ffyngau'r gawod goch yn parasiteiddio planhigion blodeuol a rhedyn a gallant gynhyrchu cymaint â phum math o sborau yn ystod eu cylch bywyd. Rhaid i rai o'r ffyngau hyn gael dau blanhigyn gwahanol i'w cynnal. Gall y ffyngau gyfyngu lledaeniad eu planhigion cynhaliol; gall rhai planhigion estron fynd yn rhemp yn absenoldeb eu ffyngau cawod goch arferol. Ym Mhrydain cofnodwyd dros 260 o rywogaethau ac mae 199 o'r rhain yng Nghymru. Ond mae'n debyg nad yw hyn yn adlewyrchu eu gwir nifer gan fod cyn lleied o sylw yn cael ei roi i ffyngau, ar y cyfan, ac mae'r ymdrech i gofnodi hefyd yn amrywio'n fawr o le i le. Yn aml iawn nid oes fawr o gydberthyniad rhwng amlder y planhigyn cynhaliol a lledaeniad y gawod goch.

From Another Kingdom

The first major exhibition in the UK to focus on the fascinating world of fungi
National Botanic Garden of Wales

This interactive exhibition, on tour from the Royal Botanic Garden, Edinburgh, reveals the intimate details of fungi in a way they have never been shown before, challenging misconceptions and showing how they are vital to the survival of life on earth.

The exhibition is in the display area of the garden's Great Glasshouse, which has been transformed into a labyrinth of themed spaces where visitors will come face-to-face with fungal diversity, myths and magic and the role that fungi play in eco-systems and recycling.

Highlights include a forest of super-sized toadstools, glow-in-the-dark mushrooms and a version of Russian roulette involving deadly poisonous fungi. A new addition, created in 2015, is a hand-stitched display of over 50 Welsh fungi, created by the Garden's Stitching B group.

For full details of opening times and admission costs contact the National Botanic Garden of Wales on **01558 667149** or visit **https://botanicgarden.wales/**
National Botanic Garden of Wales, Middleton Hall, Llanarthne, Carmarthenshire SA32 8HN

See page 51 to read all about the Garden's new butterfly house.

Saving the Gwent Levels

An appeal from Gwent Wildlife Trust

The Gwent Levels is one of the largest surviving areas of ancient grazing marsh and reen (drainage ditch systems) in Britain, and is the largest of its kind in Wales. Registered as a Landscape of Outstanding Historic Interest, its biodiversity significance is recognised through multiple and multi-layered SSSI and SINC designations.

The richness of its wildlife is legend: otters, water voles, wading birds, huge murmurations of starlings, and 25 species of rare plants including rootless duckweed *Wolffia arrhiza* the smallest vascular plant on Earth! With a managed drainage system that dates back to Roman times comes a long list of rare aquatic invertebrates. The area is a wonderful example of how human land management has generated biodiversity benefits over generations.

IT'S ALL UNDER THREAT

Based on simplistic arguments around traffic congestion and inward investment, Welsh Government has put forward its 'Black Route' M4 Motorway Relief scheme to Public Inquiry. If approved, the damage will be extensive and irreversible:

- 125 hectares of SSSI habitats, including grazing marsh and reedbed, will be lost or damaged
- Nine SSSIs will be directly damaged
- A section of GWT's Magor Marsh Nature Reserve will be compulsory purchased and lost (see Richard Bakere's article in this edition of *Natur Cymru*)
- Over 11 km of SSSI reens and ditches will be infilled or culverted and the current plans to offset this loss with freshly cut ditches is poor mitigation

Gwent Wildlife Trust and others are working hard to oppose this development, but our work comes at a high cost. Lawyers, witnesses and testimony take time and resources and we are being faced with a crude process where the price of participation in the planning process will determine the effectiveness of argument. That is a dangerous equation for meaningful sustainability.

In short, we need funds;

the Gwent Levels need funds. Any donation would be welcome and if, dear reader, you can support our efforts, please contact us by email at info@gwentwildlife.org or call 01600 740600. You can also donate directly at www.gwentwildlife.org/donate and mark your donation 'Save The Gwent Levels Appeal'.

Thank you

Urban Buzz success – the shrill carder bee in Cardiff

It's less than a year since Buglife launched its Urban Buzz project (*Natur Cymru* 58, p43), and already the hard work is paying off. Cardiff was one of the cities chosen as a flagship 'Buzzing City'. The aim was to bring colour and wildlife back into urban areas, transforming unloved and under-used patches of amenity land and turning them into havens for invertebrates. By planting wildflowers and providing nesting sites throughout the city it was hoped to create and establish new habitats, helping to reverse the decline of pollinating insects and other invertebrates as well as providing some welcome colour for the human wildlife!

Buglife have spent the intervening months working closely with City of Cardiff Council and local community groups to establish 'Buzzing Hotspots' and providing training for land managers and volunteers. One site where a lot of work has taken place is Hendre Lake in St Mellons. In order to find out how successful the work has been, and to establish exactly which species are in the area, the Bumblebee Conservation Trust (BCT) ran a BeeWalk workshop. This national recording scheme plays a vital role in monitoring how bumblebee populations change over time, detecting early warning signs of population declines, and it relies on individuals, many of them volunteers, to report their findings.

Happily, they can also report successes! The workshop hit bumblebee gold when they spotted the UK's rarest bumblebee, the shrill carder bee *Bombus sylvarum*. This small, pale yellow and black bee has a distinctive high pitched buzz. Although once widespread, it now has a very limited distribution in southern England and south Wales. Sinead Lynch, Conservation Officer with BCT, has been working to conserve the shrill carder bee in Wales and was delighted to see the bee enjoying the abundant wild flowers at the Lake.

If you'd like to get involved in the project or be kept up to date with its progress or any events then please visit the Buglife website at www.buglife.org.uk/urban-buzz/cardiff or contact Michelle Bales: michelle.bales@buglife.org.uk

Mandy Marsh

The Urban Buzz is a multi-organisational Buglife initiative funded by Biffa Award, with other funding from the Garfield Weston foundation, Heritage Lottery Fund Wales, Natural England and several other sources. The national delivery partners are Buglife, Landlife, Natural England, River of Flowers, University of Bristol and University of East London.

Buglife is the only charity in Europe devoted to the conservation of all invertebrates, and is actively working to save Britain's rarest bugs, bees, butterflies, ants, worms, beetles and many more fascinating invertebrates. More information is available at **www.buglife.org.uk**
Twitter **@buzz_dont_tweet**

Bumblebee Conservation Trust
The Bumblebee Conservation Trust is a UK based charity that was established because of serious concerns about the 'plight of the bumblebee'. **www.bumblebeeconservation.org**

Buglife

Shrill carder bee *Bombus sylvarum*

Natural Resources Wales – grounds for celebration

Studies have shown that working environs can make a significant positive impact on workers' happiness and productivity. At the Natural Resources Wales offices at Maes y Ffynnon in Bangor, it may be pretty crowded within the buildings, but outside there is definitely space for nature.

Excluding the buildings and trackways, Maes y Ffynnon comprises roughly 1 ha of grounds. Much of this is occupied by trees, with many hedgerow standards being retained when the buildings were erected in 1980, and more trees having been planted since to landscape the site. However, in the summer months it is the grasslands around the buildings that are the most striking feature. Initially these areas were kept very short by frequent cutting, but after the Countryside Council for Wales took over part of the premises it was realised they were much more interesting than the average amenity grassland. In the mid-2000s a working group was set up specifically to target management of the grounds in a more environmentally sensitive way, and a key part of this was to leave the grassland areas uncut through the spring and early summer. Suddenly, a wealth of wildflowers become apparent. They included species which would once have been common in the hay meadows and pastures of the Welsh countryside but which are now much reduced in frequency, due largely to modern agricultural practices such as the reseeding of grassland and use of artificial fertilisers.

More than 10 years on, and the Maes y Ffynnon grasslands are thriving. The more open areas are particularly rich, with herbs such as common bird's-foot trefoil, common cat's-ear, black knapweed and hay rattle, growing amongst a range of grass species such as common bent, Yorkshire fog, red fescue and sweet vernal grass. In damper areas, greater bird's-foot trefoil and marsh bedstraw are evident, while in more shady situations common dog's violet, primroses and wild strawberry

Stuart Smith

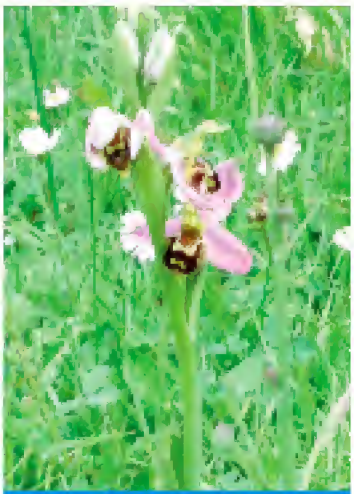
Greater butterfly-orchid amongst common spotted orchids

can be found. However, the real stars of the floristic show are the orchids. They appear to have benefited enormously from the late cutting regime, which allows them to flower and seed before the dead heads are removed along with the rest of the 'hay'. By far the most frequent orchid is the common spotted, which each year produces many hundreds of inflorescences. This species, as the name suggests, is relatively common across the country, at least by orchid standards, but not so the three other orchid types seen here: in recent years there have been a dozen or more bee orchids and single spikes of both northern marsh orchid and greater butterfly-orchid. The latter species is of particular interest as the nearest known population is more than 4 km to the west, at the National Trust's Plas Newydd property. Orchids have tiny seeds that can travel long distances, so it may have been blown in on a strong westerly wind, or perhaps it came in on the boot of field surveyor just back from a site visit.

A single greater butterfly-orchid spike has now been in evidence for three years. The species is night-scented and pollinated by large moths, and it was a favourite of Charles Darwin, who noted the differences between the greater and lesser butterfly-orchids, especially in the way they are pollinated - the greater butterfly-orchid pollinia (pollen sacs) attach to the insect's eyes for transfer to another flower (in lesser butterfly-orchid they attach to the proboscis).

In the summer months, these herb-rich areas are, not surprisingly, buzzing with bees and other pollinating insets. Species regularly seen include various bumblebees, common carder-bee and ringlet butterfly. Cutting the grassland in late summer and autumn prevents taller grasses taking over in the long term and aids the emergence, in late autumn, of a range of grassland fungi such as waxcaps (eight species recorded) and yellow club fungus.

The grasslands at Maes y Ffynnon are an illustration of how existing flower-rich habitats can be easily maintained through simple management of late summer cutting, with the clippings removed, and no fertiliser, giving nature a home and at the same time providing an attractive backdrop for office workers.



Mandy Marsh

Bee orchid

Stuart Smith
Grassland ecologist, Natural Resources Wales

Wales Biodiversity Partnership Conference 2016 Delivering Nature Recovery in Wales

Welsh Government has set out a Nature Recovery Plan with the stated aims of:

- putting nature at the heart of decision-making
- increasing the resilience of the natural environment
- taking specific action for habitats and species.

But how are these aims to be achieved? More specifically, who is going to achieve them? The task often falls to 'the usual suspects' – that is, those who already work in the conservation field and who have often spent many years fighting the environment's corner. But do we need to do things differently?

This year's WBP conference, held at Bangor University, branched out and included several speakers from the business sector, whose companies - Interserve, Network Rail and Dŵr Cymru - are already trying to do their part in managing their estates for nature. The premise is that if the Nature Recovery Plan is going to work it needs to demonstrate that industry and caring for the environment are not incompatible. Research is increasingly proving that nature brings measurable health and economic benefits. It is only when the environment becomes personal and relevant that real change will start to happen.

Green **Bookshelf**

Mountain Flowers
Michael Scott
Bloomsbury 2016
Hardback £35
416 pages

Mountain flowers have a purity and integrity which have drawn generations of botanists to the hills. These plants provide rich rewards for the exertions of hill walking, and offer up puzzles which make them natural subjects for study. They have tickled scholarly fancies, resulting in numerous texts on upland vegetation.

Michael Scott's introduction to the 4th volume in the British Wildlife Collection series sees him climbing an unremarkable hill in the west Highlands of Scotland with a precious book in his knapsack. It is John Raven and Max Walters' classic 1956 New Naturalist *Mountain Flowers*, a book which inspired many of his days in the hills. In the preface he tells us that he has long wanted to write his own Mountain Flowers.

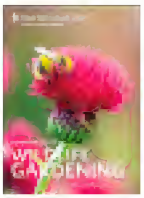
In the earlier volume Max Walters comments: "There isn't a single rare or local mountain plant in the British flora about which we have anything approaching adequate information to form a basis for an explanation of its restricted occurrence." Michael Scott's mission is to bring the huge amount of new knowledge which has been garnered in the intervening six decades to the modern reader.

Yet many mountain plants remain enigmatic, and one of the strengths of this volume is the way it opens up the mysteries of mountain plant distribution; indeed Scott challenges the reader to disprove his propositions. Although botany has become an endangered subject in British universities, I am sure students will take up the challenge, and this book will inspire them in the way that the earlier one did Scott. They may not put it in their knapsacks, though, as it is nearly three times as heavy.

Scott's clear style borrows from his years of tutoring students. We travel with him from southern Britain northwards, via Brecon Beacons and the mountainous heart of Wales, searching out the chosen 150 or so plants, true montane species. His descriptions of botanical highlights are most vivid for the sites he knows best, in the Highlands of Scotland. First-hand accounts of his trips and respectful portraits of upland botanists lighten the text, necessary as the density of botanic knowledge and some inevitable repetition threatened at times to send even a serious plant addict like me off to the land of nod.

I have a regret, which is that Ireland is excluded from this volume. It has a wonderful, albeit limited, upland flora, which sometimes confounds conventional plant wisdom. If you want to climb a mountain with slippers on, botanically speaking, there is no better place to do it that the Burren on Ireland's west coast. There you will find gentians, sandworts, saxifrages, shrubby cinquefoil and many more members of Scott's target list. When you have wandered through lawns of mountain avens, mountain everlasting too numerous to count, and mountain pansy at sea level, as I did recently, his accounts of these species seem incomplete. Britain and Ireland were joined when artic-alpines plants were in the ascendant, so our montane flora has a shared story. But Scott has filled his book to bursting with accounts of these plants in the island of Britain, so I should not complain. This is a fine volume in a new series which is shaping up very well.

James Robertson



RHS Companion to Wildlife Gardening
Chris Baines
Frances Lincoln
2016
Hardback 272 pages
£25.00

Cicero 106-43 BC said 'If you have a garden and a library you have everything you need.' One can say the same about this brilliantly illustrated and fully revised edition of the author's *How to Make a Wildlife Garden*, first published in 1985. A sumptuous production, no household should be without a copy; however small your garden is, you can still make it better for wildlife.

It is a book full of practical advice: which plants to choose for bees, birds and butterflies, how to construct the ideal wildlife pond, where to position nest boxes, how to enjoy wildlife in any size of outdoor space. Good gardening is at the heart of this book, but it is also a celebration of the rich variety of wild plants and animals that can bring your garden to life. Even a window box can play its part when stocked with the right flowers.

It was staggering to read that there are some 400,000 hectares of private gardens in Britain and,

together, they occupy much more land than all the official nature reserves combined. Although gardens cannot replicate our nature reserves, or indeed much of the wilder countryside, they do have an increasingly important part to play in the well-being of our wildlife.

As the author says, "your garden, however small it is, can make a real difference". With the RHS Companion to hand and suitably inspired, why not persuade your neighbours to adopt the same ideas and you will soon be living in a wildlife wonderland.

David Saunders

Falcons
Richard Sale
Harper Collins, London, 2016
Hardback £65.00
Paperback £35.00
594 pages

Richard Sale has produced a most comprehensive and copiously illustrated book, number 132 in the New Naturalist series, on the natural history of the four breeding species of falcon in the UK: the peregrine, kestrel, hobby and merlin.

The book starts with a short section on falcons worldwide and a comparative study of the four species. A chapter on hunting then follows which discusses the strategies used by each of the species to find and catch prey. This concentrates on the superb flight skills of the falcons, but with each species exploiting differing aspects of this potential to capture a different range of prey species. For me, a hobby catching dragonflies over open water exhibits perhaps the most impressive of these skills.

There are then four substantial chapters on each of the species in turn, which cover all aspects of their biology, behaviour and ecology. The author brings together a great volume of published research, all accurately referenced, into an engaging summary, full of illustrations, clear charts and diagrams. These are grouped under description, habitat, diet, territory, breeding, movements, winter density, survival and concluding with a section on “friends and foes”. There is much interesting and engaging material in these accounts that has encouraged me to observe falcons much more closely than before.

The final section of the book moves into the conservation biology of the falcons, looking at past, present and future populations. It reminded me of the superb work done by Derek Ratcliffe on peregrines in the early 1960s, linking DDT and other pesticides with reduced eggshell thickness and consequent breeding failure. The book is full of these accounts, relating the work of many researchers to tell a more complete story.

Do read or dip into this book if you like falcons and want to learn more about them. Let us hope that this impressive synthesis of information can help lead to an improved future for our falcons in the post Brexit Welsh countryside and, in the case of peregrines, also in our towns and cities.

David Parker

Guests of Summer - A House Martin love story
Theunis Piersma
British Trust for Ornithology, 2016
(originally published in Frisian in 2014)
Paperback £12.30

The author is an eminent Dutch ornithologist who is best known for his work on waders. He lives in the Friesland village of Gast, where he has been studying the house martins nesting on his house. This is a small but not slight book, with 96 pages arranged in 30 chapters, plus ten pages of references. The text covers just about anything you might like to know about house martins – where they nest and roost, what they eat, their breeding cycle, their predators, and what is known about their migration to and from Africa. Ringing has revealed the migration routes of the swallow in great detail: it is easy to ring the chicks in their open nests in stables and cowsheds, and outside the breeding season the birds roost in reed beds, where they can be trapped. In contrast, house martin chicks cannot be removed from their mud nests (which only have a tiny entrance hole) to be ringed, and adults don’t roost in reed beds, so we know much less about their movements. They are, of course, too small for researchers to attach a satellite tag, otherwise we would know more!

Many thanks to Theunis for writing this delightful book, which is highly recommended.

Geoff Gibbs

Recent highlights of Welsh mineralogy

Wales has a long history of mineral extraction for metals, fuels and aggregates. These operations have left their mark on the natural landscape in the form of mines, quarries and open pits which often divide public opinion. Historically, the benefit of jobs was seen as far more important to local communities than the detrimental effect on the local wildlife and countryside. To geologists these extractive operations have provided a glimpse into the history of the earth which would not otherwise be visible from the surface.

Dolyhir Quarry

Minerals rarely form large, perfectly formed crystals and some, by their very nature, only ever occur as microcrystals. Dolyhir Quarry, near Old Radnor in Powys, is one of the finest modern localities for studying microminerals and has been designated as a Site of Special Scientific Interest (SSSI). Here complex geological conditions have created the environment necessary for a range of exotic minerals to form. Ancient Neoproterozoic (around 560 million years old) clastic sediments, cut by a series of vertical dyke-like igneous dolerite intrusions, form the basement rocks. During the Silurian period (around 430 million years ago), tropical seas deposited layers of fossiliferous limestone. Subsequent burial deep beneath the Earth's surface resulted in hydrothermal solutions filling fractures in the rock with a broad range of minerals.

The most intriguing of these is ewaldite, a barium-sodium-calcium-yttrium (plus other Rare Earth Elements)-potassium carbonate hydrate. This rare mineral is known from only eight localities worldwide and the crystals found at Dolyhir are of exceptional form and size, occurring within millimetre-size open fractures rather than in true mineral veins. These small fractures, sometimes referred to as 'alpine-type' veins on account of their similarities to those in the mountains of Central Europe, are characterised by open cavities within which perfectly formed crystals have been able to grow, with the minerals' chemistry mirroring the composition of the host rocks of limestone, dolerite and clastic sediments.

D.I. Green

A 2.5 mm-long yellow ewaldite crystal associated with a colourless cruciform-twinned prismatic harmotome crystal from Dolyhir Quarry.

South Wales

It has long been known that beautiful crystals occur within the sandstone and clay ironstone horizons associated with the Carboniferous Coal Measures (approximately 300-312 million years old) in south Wales. Reverend J. J. Conybeare used the term 'Merthyr diamond' as early as 1821, in reference to small rock crystals found in the ironstone there. Historic deep mining collieries provided only limited geological exposures, but the modern development of opencast coal operations has allowed geologists to witness the full geological succession through the coal measures.

One opencast coal site in particular has produced a remarkable array of fine quartz crystals exceptional in terms of both their size and crystal form. At Nant Helen, near Abercraf, quartz crystals are common in vertical fractures within 1-2 m thick sandstone horizons immediately above the 'Nine Foot' coal seam. The crystals are frequently perfectly formed and pyramidal, or bipyramidal, in habit. The majority of the crystals are 2-5 cm in length, but occasionally they reach over 10 cm.

Despite their larger size these crystals are formed through a geological process very similar to

A. Thorogood

An 8 cm-long bipyramidal quartz crystal collected at Nant Helen Opencast Coal Site in 2013.

the ewaldite microcrystals, with a composition directly comparable to the chemistry of their host rock. Through a process of burial and folding, the Coal Measures have been heated and fractured with solutions passing through the rock. Leaching of chemical elements (silicon and oxygen) occurred and, due to the brittle nature of sandstone relative to the surrounding mudstone and clay ironstone, vertical fractures formed. The mineral-rich solutions entered the cavities and slowly precipitated quartz in the form of large individual crystals. The quartz crystals occur within sandstone, itself made of tiny grains of quartz.

Tom F. Cotterell
Senior Curator of Mineralogy, Amgueddfa Cymru – National Museum Wales.

My thanks to Lafarge Tarmac (Dolyhir Quarry) and Celtic Energy (Nant Helen) for allowing access to their sites, without which none of these mineral discoveries would have been made.

References

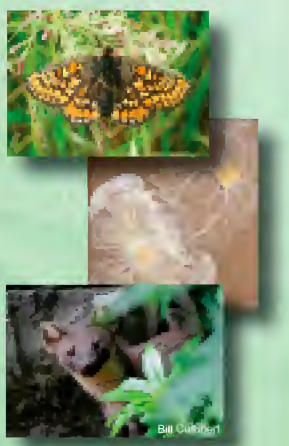
1. Conybeare, J.J. (1821). Description of a New Substance found in Ironstone. *The Annals of Philosophy*. New Series, 1, 136-7.
2. Cotterell, T.F., Green, D.I., Hubbard, N., Mason, J.S., Starkey, R.E. and Tindle, A.G. (2011). The Mineralogy of Dolyhir Quarry, Old Radnor, Powys, Wales. *UK Journal of Mines and Minerals*, 32, 5-61.

Cymru Anhysbys 2016 – Unknown Wales 2016

Diwrnod i ddathlu bywyd gwyllt Cymru
A day to celebrate Welsh wildlife

O bele'r coed i'r brenig cyffredin, bydd Cymru Anhysbys unwaith eto'n taflu goleuni ar rai o ryfeddodau natur anghyfarwydd Cymru. I gloi, pleser fydd gwrando ar yr Athro Mike Benton yn dod â darganfyddiad mawr y flwyddyn ddiwethaf yn fyw – y deinosor Cymreig newydd.

From the humble limpet to the charismatic pine marten, Unknown Wales once again offers an insight into the lesser known side of Wales' natural world. To wrap up we are delighted to welcome Professor Mike Benton who will bring last year's big discovery, the new Welsh dinosaur, back to life for us.



Sad 8 Hydref 2016
Amgueddfa Genedlaethol Caerdydd
Mynediad am ddim.
Ffoniwch 01656 724100 neu e-bostiwch info@welshwildlife.org i archebu lle; gadewch eich manylion a nifer y llefydd rydych am eu harchebu.

Sat 8th October 2016
National Museum Cardiff
Admission free.
T: 01656 724100 / info@welshwildlife.org to book; leave your details and number of places required.

Sitting on the fence

David Elias

This gnarly old wood looks like something out of *The Lord of the Rings*. The bent and twisted trees, festooned with lichen, appear ancient, but that is probably an effect of a hard life on boulder scree at a thousand feet in an unforgiving climate. Birch and rowan are the dominant trees, with a scattering of hazel and sallow. The only other trees I have found are three oaks, seven aspens clumped together, a couple of sycamores and a beech. The rocky woodland floor is carpeted with moss and flowering bluebells – millions of them. It is impossible to walk without crushing them.

I am sitting on top of a shed-sized boulder eating my sandwiches with a pied flycatcher chuntering at me 20 yards away. Two things interest me about this spot: firstly, amongst the grove of aspens below me are dozens of suckers 6-18 inches tall; secondly, down the side of the boulder I have just found my first bramble.

This place looks like a case of arrested development - a pioneer wood whose succession has been frozen. I can only presume it got started about 200 years ago when, for some reason, sheep grazing was negligible or non-existent. I can't find any old stumps suggesting a previous generation of trees, although I suppose oaks could have been cropped back then and no trace would remain now. Neither is this above the altitudinal limit for oaks to regenerate locally. Since its establishment sheep will have nibbled off any regenerating seedlings, condemning the wood to 'death by grazing' – like so many other woods in Wales, until recently.

Fifteen years ago this wood was fenced out as part of an agri-environment scheme and now only limited winter grazing is permitted. The aspen suckers and a few birch seedlings in open areas suggest that things are slowly changing; as does the bramble. The current regime should encourage replacement trees and so ensure the wood's survival (as long as the funding holds up). There are plenty of oaks within a half-mile radius, so the local jays could bring in acorns, some of which would grow into young trees. This could eventually become an oak wood, its succession unfrozen.

Of course the drastic reduction in grazing will have implications for much of the wildlife, not least the bluebells, which are a spectacular blue haze all around me. If brambles begin to spread they will gradually smother and shade out the bluebells, and the bryophytes and lichens on the boulders and lower tree trunks. Generally lichens prefer the light conditions of well-spaced, unshaded trees, whereas mosses and liverworts need the humid conditions characteristic of ungrazed, more closed woodlands. On the other hand, they also need the boulders and fallen wood to remain open as places to colonise. If young trees and brambles develop in the more open areas of the wood it is not clear if that would make it more, or less, suitable for migrant birds such as pied flycatcher, wood warbler and tree pipit – a group of birds of conservation concern. It is proving difficult for researchers to separate out the effects of breeding-habitat condition from other factors such as migration and wintering areas. And as for the invertebrates – does anybody know, beyond broad generalisations?

So when the farmer asked me why it was good for wildlife to have his wood fenced out I found myself prevaricating and qualifying until he looked increasingly sceptical. He knows exactly what he wants for his sheep (including an unfenced wood) and expects conservationists to be equally clear. Management prescriptions for wildlife are often complex and sometimes inter-competing, which can also make them difficult to communicate convincingly.

David Elias

From the **Garden**

Butterflies attract the crowds

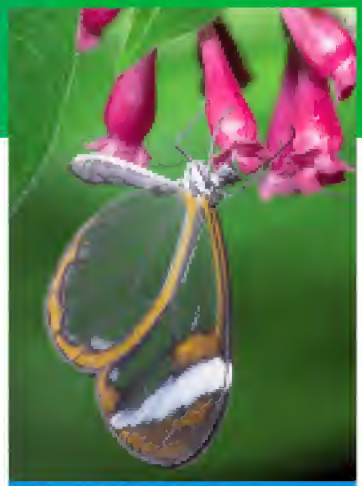
The Postman, Mormons, Sara Longwing and Julia have been attracting a lot of interest in the Garden. No, I'm not talking about religious female postal deliverers but tropical butterflies.

In June the National Botanic Garden of Wales converted its Tropical House into a tropical Butterfly House and boy what a good move this has proven to be. Don't get confused thinking that our Great Glasshouse has radically changed – that's still displaying the largest collection of Mediterranean-climate plants in the Northern hemisphere, and is still an enormous crowd-pleaser.

No, I'm talking of the rectangular glasshouse in a corner of our Double Walled Garden which we have now renamed Plas Pilipala (*pilipala* is a Welsh word for a butterfly). Since it opened in 2006 the plants in there have been beautiful and fascinating, but the theme of the plants has never caught on – tropical monocotyledons. It was intended to allow us to show a hot climate dimension to the outdoor Evolution of Flowering Plants display but, really, it was a hard topic to sell given that most of our visitors won't know the difference between a monocot and eudicot. As the person responsible for interpretation at the Garden, I found it as hard to generate enthusiasm for a monocot display as I did for a Non-Mendelian Inheritance display bed that I was asked to interpret a few years ago. In rugby terminology, these were hospital passes.

Tropical butterflies are totally different. They can be colourful, huge, see-through, exotic and graceful, just some of the qualities which have helped to make them an instant hit with visitors – our summer visitor numbers are way up on last year. Butterflies make people smile and talk to each other, and in an age of the selfie, they provide some wonderful photo opportunities which are then shared with family and friends across the world. But that's not all. As a national botanic garden, we also want to help our visitors to think and be curious about the natural world. With the aid of engaging signs, a brand new app (look for Plas Pilipala on Google Play and the App Store) and a wonderful troupe of friendly volunteers, we not only let visitors know about the lives of the exotic butterflies but we also provide a broader perspective about butterflies and other pollinators in Wales. This message is crucial for us. Our science team, led by Dr. Natasha De Vere, use their DNA barcoding expertise and extensive horticultural resource to carry out fascinating research into the floral preferences of both honey bees and wild pollinators. If we can find out what plants are most important for pollinators then we can help to ensure that these plants are available in the pollinators' natural habitat.

Garden volunteers help us to give out this message every day inside Plas Pilipala. If you'd like to join them in helping us we'd be very grateful, as would our eager garden visitors. To do this, you could either phone our Volunteer Co-ordinator Jane Down on 01558 667118 or email jane.down@gardenofwales.org.uk



Tim Jones

Glasswing *Greta oto*

Tim Jones

The Julia butterfly *Dryas iulia*

Bruce Langridge
Head of Interpretation at the National Botanic Garden of Wales

Read more about the DNA Barcode Wales Project in *Natur Cymru* 46:32.

The ups and downs of Welsh cuckoos

Did you hear a cuckoo this year? Living in Llanfairfechan on the edge of the Snowdonia National Park, I heard quite a few, including one from our house on May 27th and two near Coed Crafnant (Meirionnydd) on May 14th during a Bird Race round North Wales Wildlife Trust reserves. You may not have been so fortunate – numbers have fallen in recent years and the species was highlighted by Michael McCarthy in his 2009 book on the decline of our summer migrants, entitled *Say Goodbye to the Cuckoo*'. Cuckoos don't live in pairs; males sing to advertise their presence to females, while the females, once mated, spend their time finding suitable nests in which to lay an egg. The main hosts here are meadow pipit, dunnock and reed warbler, and all the singing males I heard this year were in areas with pipits as the host. The males don't care about pipits of course – they leave all that to the females, which are obviously skilled nest finders! A considerable amount of brilliant research has been done recently on cuckoos and their hosts, as outlined by Nick Davies in *Cuckoo – Cheating by Nature* published in 2015.

David the cuckoo who commutes from Ceredigion to the Congo

Bird ringers have been putting rings on cuckoos (mostly fledglings) for many years, but up to 2011 there was only one 'recovery' of a British-ringed cuckoo south of the Sahara. This was killed in Cameroon in the winter of 1930 – quite a time ago! The British Trust for Ornithology decided that the iconic cuckoo needed a bit more attention, and in 2011 they started catching and satellite-tagging male cuckoos in East Anglia, at an average cost of £6,000 per bird. The aim is to study their migration routes to and from wintering grounds in forests south of the Sahara. In 2012 four were tagged in Ceredigion, as described by Graham Appleton in *Natur Cymru* 49. Cuckoos David and Lloyd reached the sub-Saharan forests, but only David made it back in 2013. Since when, he has kept going.

2016 update: David the longest-lived tagged cuckoo!

David is still performing. He left Montenegro during the evening of 17th August and nothing more was heard from his tag until a poor quality signal on 22nd August put him in the Sudan desert, 400 miles short of a successful crossing. Around mid-afternoon on 24th August good signals showed that he had successfully crossed the desert and arrived in Chad. In doing so, David became the project's longest-lived tagged Cuckoo. If he makes it back to his wintering location in the Congo rainforest, he will have completed four and-a-half migrations to and from Africa. Naturally, BTO staff and volunteers have their fingers crossed that he makes it back to Wales in 2017. Full details of the project can be found on https://www.bto.org/science/migration/tracking-studies/cuckoo-tracking

Geoff Gibbs

BTO

David the cuckoo, ready for off in 2012

Plantlife Cymru projects – get involved

CENNAD Lichen Apprenticeship Scheme
Lichen specialists are an endangered species in the UK. This scheme offers learning opportunities for people to reach a level of knowledge where they can confidently contribute to lichen monitoring, particularly of species associated with Atlantic woodlands and wayside trees.

For more information please contact Tracey Lovering, Plantlife Cymru Lower Plants and Fungi Officer at Tracey.Lovering@plantlife.org.uk

Keeping the South Gower Cliffs Colourful
Some of the UK's rarest wildflowers, lichens, liverworts and mosses can be found at Gower but they are in grave danger of being swamped by cotoneaster, an invasive garden escapee.

A number of species are under threat, including yellow whitlowgrass *Draba aizoides*, juniper *Juniperus communis* and basil-thyme *Clinopodium acinos*. Without action, these and other species could become extinct here. The project aims to remove the cotoneaster and allow the natural mosaic of vegetation to flourish again.

Dune rejuvenation in Carmarthen Bay
Large areas of the Carmarthen Bay dunes have become dominated by thick grass, shrubs (including invasive Sea Buckthorn) and conifer plantations, threatening the survival of a host of rare and specialised species including fen orchid *Liparis loeselii*, sea stock *Matthiola sinuata*, and petalwort *Petallophyllum ralfsii*. Urgent action is needed to remove the invasive vegetation and improve the fortunes of these rare plants.

Mapping Wales's important arable plants
As a result of intensive farming practices and the demise of mixed faming, arable plants are the fastest declining group of plants in Wales. Plantlife Cymru has been working with Welsh Government and Natural Resources Wales to map the distribution of threatened species. You can download a summary or full report of their findings on the Plantlife Cymru website under the Conservation Projects section. **http://www.plantlife.org.uk/**

For more information on any of these projects please contact Colin Cheesman: 02920 376193, colin.cheesman@plantlife.org.uk

North Wales Wildlife Trust Annual Lacey Lecture 2016

Dr Trevor Dines, botanical specialist with Plantlife and star of Channel 4's *Wild Things,* will be taking a post-lecture Q&A session and giving guests an opportunity to chat directly with him during the break.

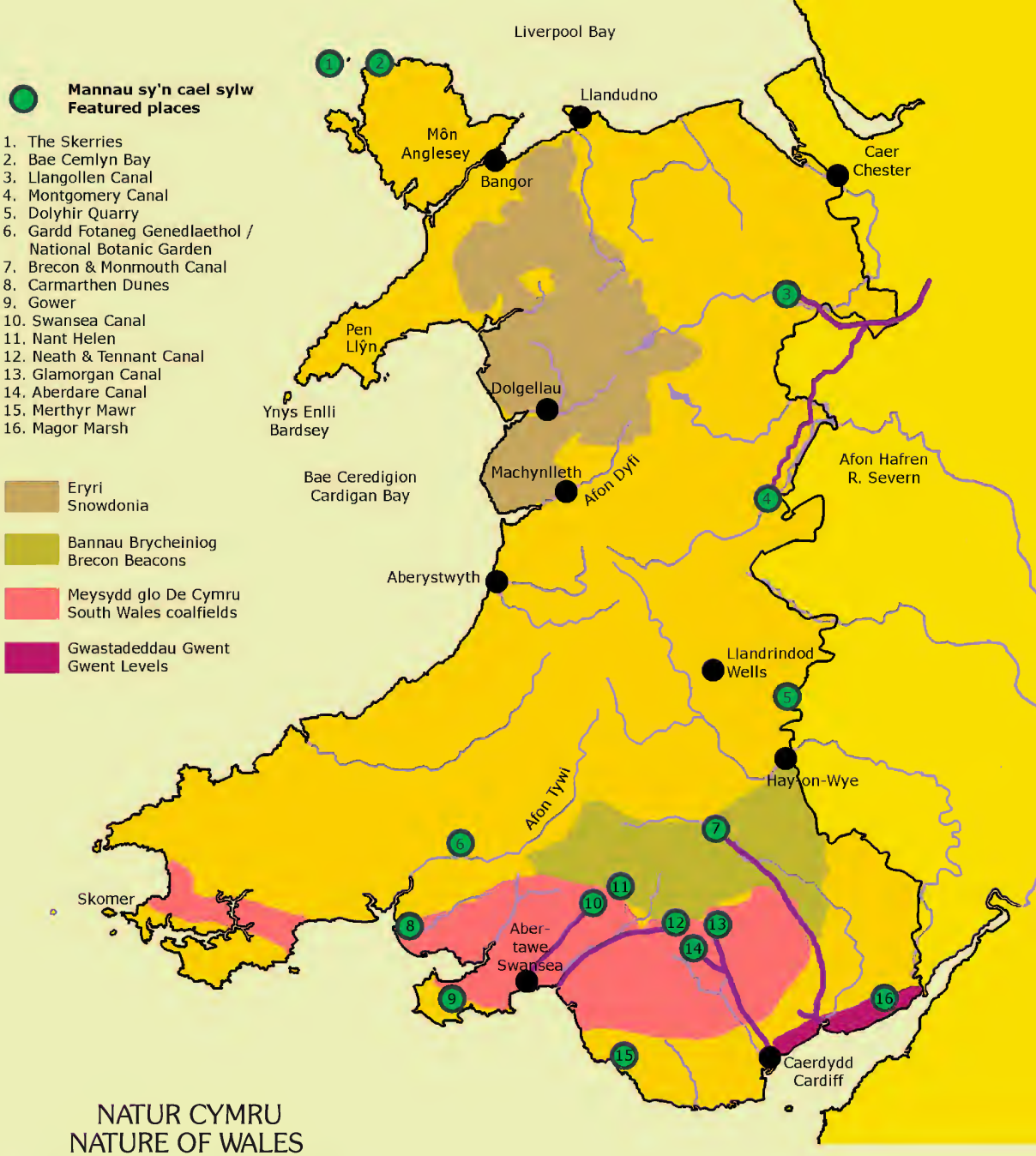
Friday 11th November
7.00 – 9.30pm, Venue Cymru, Promenade, Llandudno LL30 1BB.
Tickets £10 from your local NWWT branch or main Bangor office – please send a stamped addressed envelope, call 01248 351 541 or email nwwt@wildlifetrustswales.org
Tickets £12 (+booking fee) from Venue Cymru box office, 01492 872000 or www.venuecymru.co.uk

The 8th Annual William Condry Memorial Lecture

Ddoe a Heddiw - Now and Then
A journey through the world of Welsh and other birds
Jonathan Elphick

Jonathan Elphick grew up on the North Wales coast, where he came under the influence of the important Welsh naturalists Tony Angell and Peter Hope Jones. In thrall to the writings of Bill Condry, he is now himself one of our most eminent ornithological writers. Sixty years ago he was free to roam all day around a wide area of traditional farmland, hills and coast. His talk will cover the endless fascination of the birds of North Wales, and the losses and successes of recent years. (Darlith Saesneg – English language lecture)

Saturday 1st October 2016
MOMA Wales, The Tabernacle Machynlleth.
Doors open 7pm, programme starts 7.30pm. Tickets: £5.00 on the door, booking not essential. Refreshments included.



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